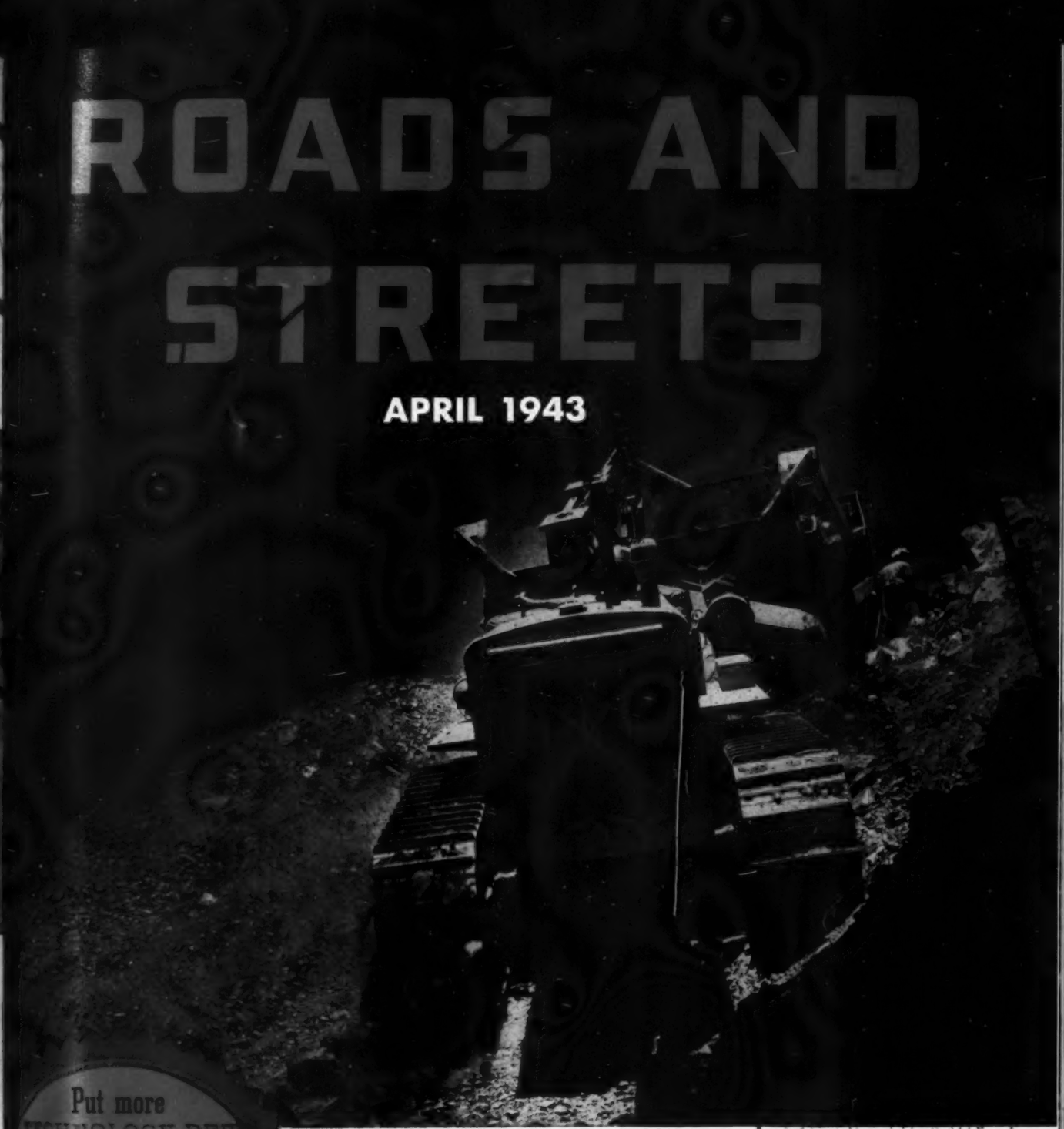
ROADS AND STREETS

APRIL 1943



"Caterpillar" Diesel Tractor and Le Tourneau Carryall — both Timken Bearing Equipped—working on a California State Highway.

TECHNOLOGY DEPT.
APR 5 1943

Put more punch in your construction equipment for Victory; redesign to increase your use of Timken Bearings.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

Give your machines increased speed and endurance; cut down maintenance; keep 'em rolling 'til the job's done—the war won. Timken Tapered Roller Bearings will help to do it. A few Timken Bearings are better than none, but only when you have them at every suitable position will you be assured of complete protection against friction; radial, thrust and combined loads; and misalignment of moving parts. It will pay you to make sure you have them. The Timken Roller Bearing Company, Canton, Ohio.

"All There Is In Bearings"

COPYRIGHT 1943 BY THE TIMKEN ROLLER BEARING COMPANY

ADAPTABLE
TO ANY JOB

TO KEEP YOUR GRADERS ROLLING FOR VICTORY...

- ✓ Check condition of engine regularly.
- ✓ Change lubricating oil and renew filter elements every 100 hours of use.
- ✓ Lubricate all parts of grader regularly.
- ✓ Service air cleaner every 10 hours of use.
- ✓ Clean fuel oil filters at least every 60 hours.
- ✓ Don't ride clutch. Adjust clutch pedal when and as needed.
- ✓ Keep electrical system in good condition —check battery regularly.
- ✓ Keep lost motion out of grader—use adjustments for wear and replace parts worn out.
- ✓ Keep tires inflated to recommended pressure.

If you need help or advice on any of the above, see your local Adams distributor.

DESIGNED to be *adaptable to any job* the Marines may be called upon to do is the Corps' new "Alligator Tank" which travels on water or land. Equally *adaptable to any grading job* are Adams Motor Graders. . . . Smart operators utilize Adams power, traction, strength and speed on grading jobs that range from bank cutting to ditching and from heavy scarifying and oil mix to high-speed maintenance. They take jobs as they come and quickly adapt their Adams machines to them. . . . Today Adams machines are proving their adaptability in government service. Tomorrow they will prove even greater versatility on your peace-time jobs!

J. D. ADAMS COMPANY • INDIANAPOLIS, INDIANA

Adams motor graders, leaning wheel graders, elevating graders, hauling scrapers, tamping rollers, bulldozers and road maintainers are used by allied forces throughout the world.

Adams

ROAD-BUILDING AND EARTH-MOVING EQUIPMENT

A FEW FEET OFF...

can double wire rope service

by relocating "grief spots" at drums and sheaves

For downright ability to take a beating, wire rope rates pretty close to the top of the list. However, simply because wire rope ***can*** stand up under rough-and-tumble treatment is no reason to subject it to abuses which can be avoided.

For example, by the simple operation of cutting off a short length at the drum end of a wire rope, you can frequently increase its service life by a worthwhile margin.

The reasons are as follows:

In the normal operation of rotary drilling rigs, crawler cranes, derricks, some mine shaft hoists and many other types of rope-using equipment, one or more short sections of the rope are apt to be exposed to concentrated wear.

The most serious "grief spot" occurs where the rope climbs from one layer to another on the drum. Severe pinching and abrasion are inevitable here, due to pressure between the wire rope and the flange of the drum.

By cutting off at least half a "wrap" from the drum end of the rope, you shift the section of concentrated wear and bring fresh rope over the "grief spot."

Even when there is no overwrapping on the drum, there may be concentrated wear over sheaves due to repeated lifts from a constant height.

Both of these conditions can be guarded against by systematically cutting off a few feet of rope before it becomes badly worn in any specific location. By installing a few extra feet of rope at the start, allowance can be made for "pruning," and the life of the entire rope may be as much as doubled.

The small amount of time and expense involved in this simple maintenance precaution will repay you many times over in increased wire rope service.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

ROADS AND STREETS

Vol. 86, No. 4 • April, 1943

ECA

A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; and to the construction and maintenance of airports.

WITH ROADS AND STREETS HAVE BEEN COMBINED GOOD ROADS MAGAZINE AND ENGINEERING & CONTRACTING

CONTENTS

Ohio Maintenance Geared to Wartime 39
By H. D. METCALF, Chief Engineer
Bureau of Maintenance, Ohio Department of Highways

Pre-Framed Timber Bridges in New Hampshire 44
By H. E. LANGLEY, Bridge Engineer
New Hampshire State Highway Department

Load-Transfer Sills Under Dowel-less Joints 47

The Electron-Shell of Planet Genesis 50
By HALBERT P. GILLETTE

Explosives (Part 3) 52

Albany Speeds Spring Street Cleaning 57

Editorial 58

Cost Index 60

Georgia's Steel and Timber Bridge Maintenance 64

Construction Equipment Maintenance 73

Equipment Maintenance in Massachusetts 75
By J. E. LAWRENCE, Maintenance Engineer,
Mass. Dept. of Public Works, Boston, Mass.

Burlington's Strange Hybrid Machines 79

New Equipment and Materials 85

Coronach 86

With the Manufacturers 88

Published by Gillette Publishing Co. Acceptance under the Act of June 5, 1934, authorized January 25, 1938, at Chicago, Illinois. Subscription price $3.00 per year in the United States, $3.60 per year in Canada, $4.00 per year for foreign mailing.

STAFF

HALBERT P. GILLETTE, Editor-in-Chief

EDWARD S. GILLETTE,
Editor and Publisher

CHARLES T. MURRAY
Managing Editor

JOHN C. BLACK, Field Editor

HAROLD J. McKEEVER
Associate Editor

LT. COL. V. J. BROWN
Publishing Director
(Absent on Military Duty)

H. J. CONWAY
Advertising Editor

L. R. VICKERS
Promotional Director

GILLETTE PUBLISHING COMPANY

330 S. Wells St., Chicago, Ill.

ESTABLISHED 1906

PUBLISHERS OF

ROADS AND STREETS

POWERS' ROAD AND STREET CATALOG

WATER WORKS AND SEWERAGE

CAMINOS Y CALLES

TECHNICAL BOOKS

BUSINESS REPRESENTATIVES

Chicago Office
L. H. LINGNOR, Manager
E. C. KELLY
E. H. HICKEY
330 S. Wells St., Chicago, Ill.
Telephone: Harrison 1843

New York Office
J. M. ANGELL, JR.
155 East 44th St., New York, N. Y.
Telephone: MUrrayhill 2-6023

Cleveland Office
LEE B. McMAHON
859 Leader Bldg.

Los Angeles Office
DON HARWAY & CO.
816 West Fifth St., Los Angeles, Calif.
Telephone: Mutual 8512

Just 3 Words

PLEDGED

CONSTRUCTION EQUIPMENT CONSERVATION

—but what a whale of a lot they mean!

Photo courtesy of Broderick & Bascom Rope Co.

C-o-n-s-t-r-u-c-t-i-o-n
E-q-u-i-p-m-e-n-t
C-o-n-s-e-r-v-a-t-i-o-n

. . . that sums up a big part of today and tomorrow's job

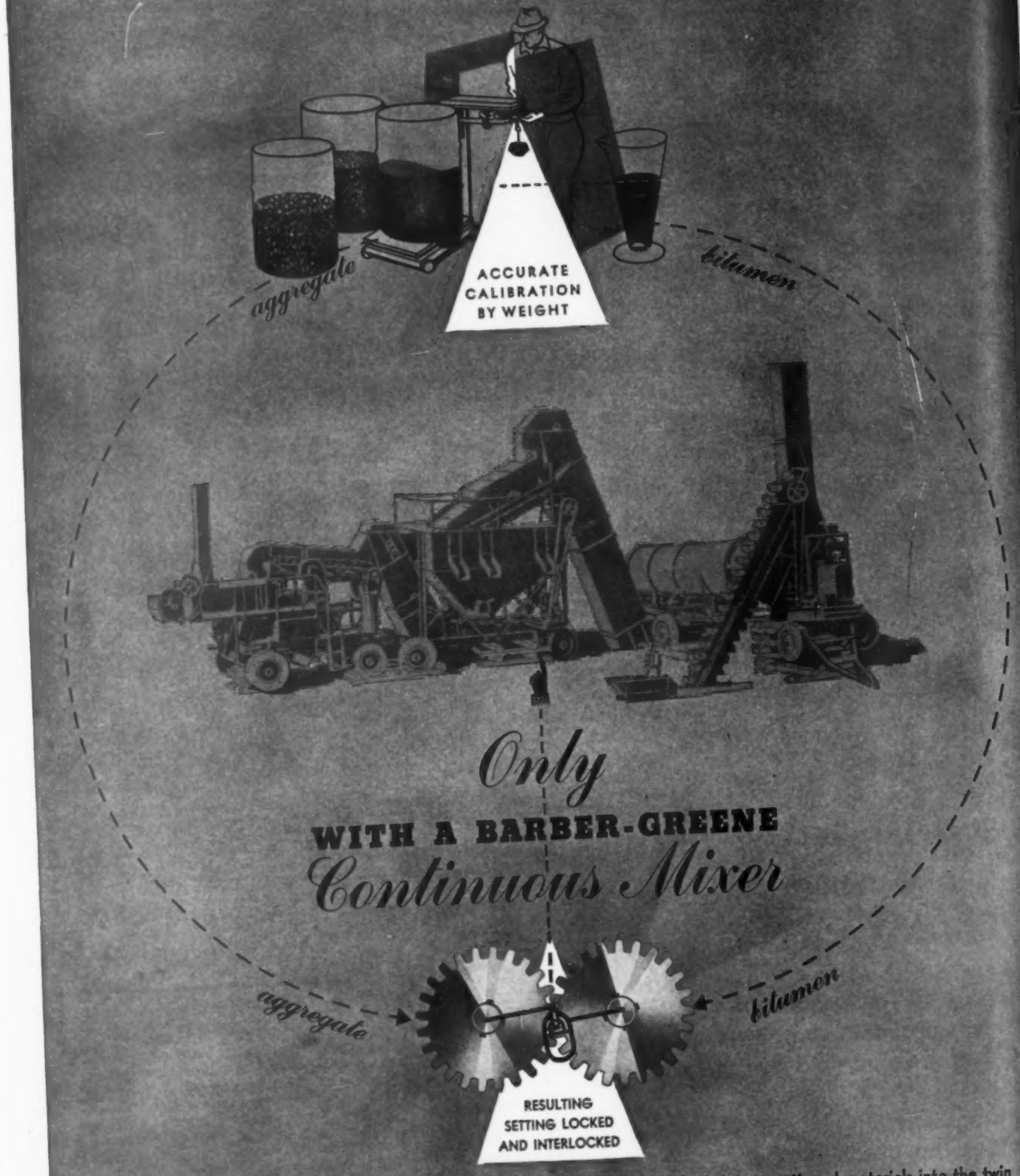
- New construction equipment is hard to get—that means you'll have to take care of what you have.
- Time-consuming breakdowns must be avoided as much as possible; emergency repairs must be made quickly, and frequently without the usual type of critical materials and parts.
- Jobs *must* be completed on time or ahead of schedule—that means extra work—faster, more skillful operation.

How About You?

Have you joined the ranks of the hundreds of owners and operators who are doing their darndest to do more with what they've got . . . to make their equipment last longer and work faster? You can tell these men by this 5" red, white and blue emblem on their trucks, tractors, bulldozers, shovels, cranes and scrapers. If you want to show others that you are conserving, write for one or more of these free emblems today.

THE THEW SHOVEL COMPANY
Lorain, Ohio

THEW-LORAIN CRANES • SHOVELS DRAGLINES • MOTO-CRANES



Only

WITH A BARBER-GREENE

Continuous Mixer

The simple procedure illustrated above accounts for the untiring accuracy of the Barber-Greene. The desired quantity of each size aggregate is weighed, and the feeder gates locked at this setting. The bitumen metering pump is set for the desired ratio, and mechanically interlocked with the aggregate feeder. The Barber-Greene achieves POSITIVE PROPORTIONING in bituminous mixing. Feeding these accurately proportioned materials into the twin pugmill in a proportioned continuous stream, the Barber-Greene easily delivers a uniform mix, ton after ton—mile after mile. The Barber-Greene has set entirely new standards for short inexpensive moving and set-up time. Investigate this ingenious machine. Complete literature on request. Barber-Greene Company, Aurora, Illinois.

41-16

BG

BARBER GREENE

Roosts for Warbirds

BLAW-KNOX EQUIPMENT HELPS CONSTRUCTION BATTALIONS BUILD VITAL BASES ALL OVER THE WORLD

Picked men and picked equipment are today building roads and airfields and other structures in many a far-flung American outpost.

The tools of America's construction battalions are the same favorite tools of the construction industry. Blaw-Knox Finishing Machines, Concrete Spreaders, Road Forms, Bulk Cement Plants, Batcher-plants, Clamshell Buckets, Tamping Rollers, Standard Steel Buildings, etc.—are helping to build these springboards to victory.

BLAW-KNOX

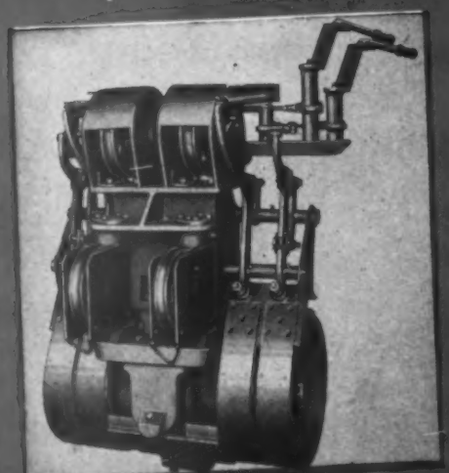
BLAW-KNOX DIVISION OF BLAW-KNOX CO.

2003 FARMERS BANK BLDG. · PITTSBURGH, PA.

NEW YORK · CHICAGO · PHILADELPHIA · BIRMINGHAM · WASHINGTON

Representatives in Principal Cities

GOOD NEWS *for tomorrow*



BUCKEYE POWER CONTROL WINCHES

These fast, rugged winches step-up output from all cable-controlled equipment. Made in medium and heavy-duty types, single and double drum models to fit all makes of crawler tractors. To get the *most* out of tractors and equipment, get the facts about these output-builders . . . write for information now!

BUCKEYE BULLDOZERS & TRAILBUILDERS

Every practical feature to make tractor power produce the *most* is provided in these modern dirt-movers.

Balanced weight maintains full crawler contact with the ground for better traction; engineered blade curvature steps up dirt moving ability and saves power. You'll find many other time and money-saving features — write for complete data.

equipment users from today's BATTLEFIELDS

IN this mechanized war, Buckeye tractor equipment has become *battle-front* equipment . . . serving under every conceivable condition, undergoing punishment that puts every part, every feature to the most gruelling test — punishment that no peacetime construction job could possibly equal. The invaluable experience of this world-wide "field test" has not only helped create the better "fighting tools" we need for victory, but also holds the promise of more efficient, faster-working, longer-lasting equipment that will make the building of our new peacetime world facilities an easier, faster and cheaper job.

BUCKEYE TRACTION DITCHER CO.
Findlay • Ohio

For real help in meeting today's problems, in planning for tomorrow's big job—*keep in touch with your Buckeye distributor!*

Check Pages 14-31

50 YEARS OF PROGRESS BUCKEYE 1892 1943

Built by Buckeye

Convertible Shovels

Trenchers

Tractor Equipment

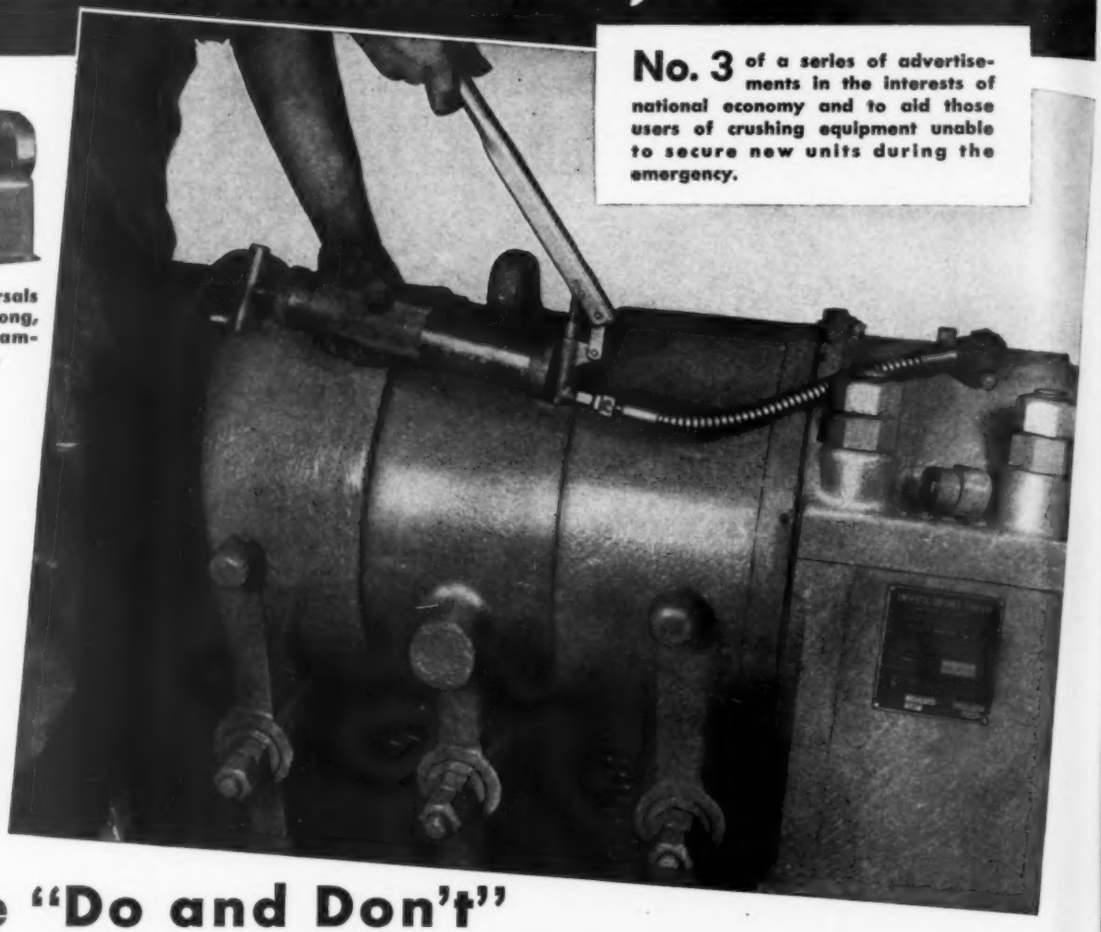
R-B Finegraders

Road Wideners

Spreaders

The Care and Maintenance of Rock Crushers

Only Universals feature strong, light, streamlined bases.



No. 3 of a series of advertisements in the interests of national economy and to aid those users of crushing equipment unable to secure new units during the emergency.

The "Do and Don't" of Crusher Lubrication

Today lubrication is more important than ever before. Lack of grease can cause costly bearing failures and bearings are made of vital, much needed alloys.
These ten simple rules, strictly observed, will help your crusher to stay on the job until the day when parts are plentiful and new crushers obtainable.

1. Don't keep lubricant containers near crushing plant—as float dust is penetrating and a little grit in your grease may ruin a bearing.
2. Don't put oil or grease in bearings or fittings until they have been wiped off with clean rags. Flush them with a thin oil—don't use kerosene.
3. Use only clean containers.
4. Make it a practice to inspect bearings often—at least four times daily with bronze bearings; once daily with roller bearings—checking them for over-heating.
5. Don't use cheap lubricants—they cost more in the long run. Use only tested lubricants as indicated on name plate.
6. Place a burlap bag saturated with crank case drainings on top of the lower end of the toggle—it helps keep out dirt and lubricates the lower toggle seat.
7. Keep adjustment wedges and screws clean. Oil regularly to prevent rust. Unless already enclosed, wrap screws with cloth, tied on, to keep out grit.
8. Squirt out a shot of grease from gun before greasing to clean nozzle.
9. Don't over-oil or grease. Too much lubricant can overheat bearings. Bearings have to "breathe" but should be able to contact grease. Use thinner lubricant in cold weather. Notice oil level plugs or name plates indicating quantity to use.
10. Don't keep adding oil when it should be changed. Changing gets rid of any dangerous accumulation of dirt.

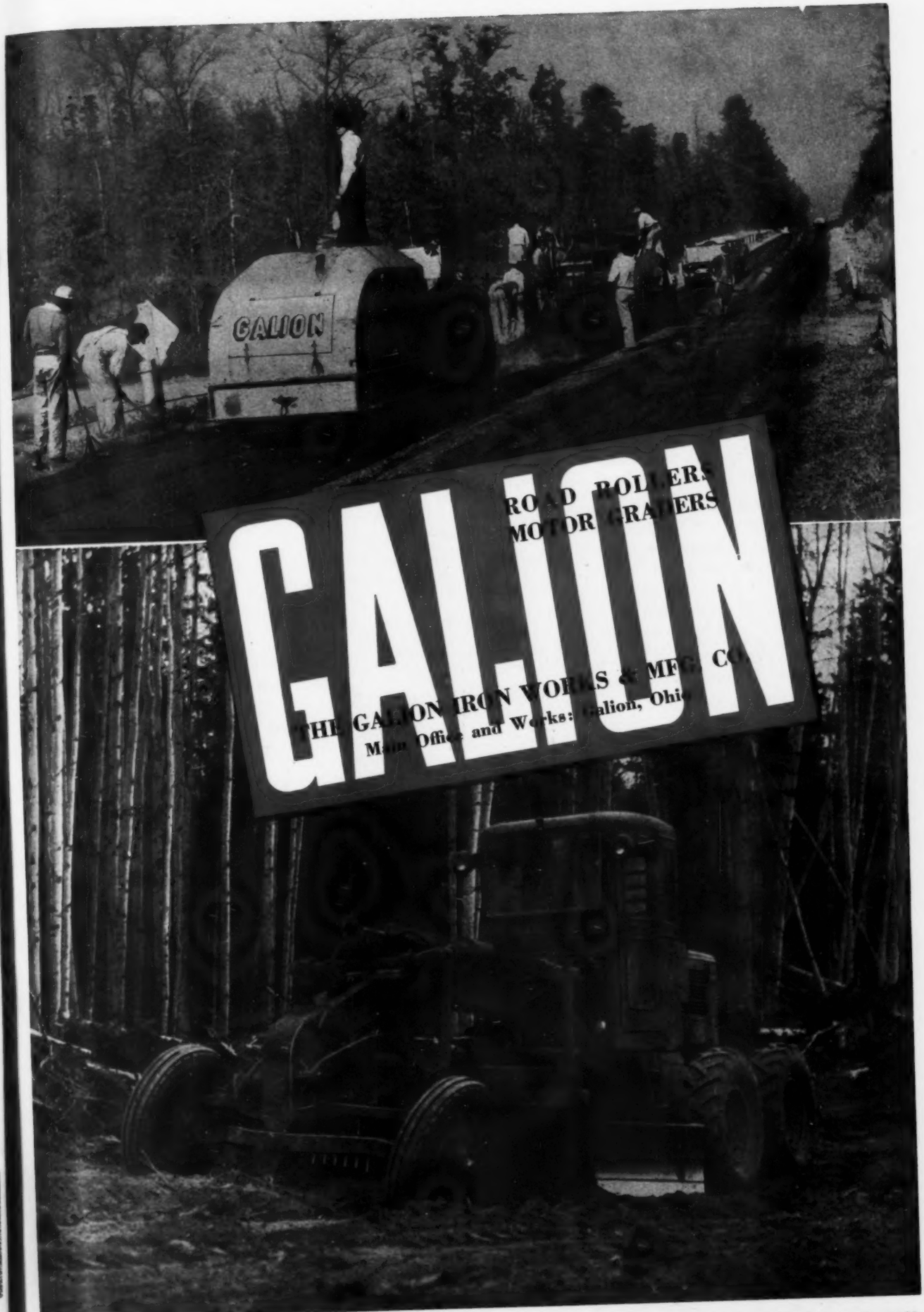
EVERYBODY EVERY PAYDAY AT LEAST 10%

We're 100% Ten Percenters!

UNIVERSAL ENGINEERING CORP., Formerly UNIVERSAL CRUSHER CO.
631 C Avenue West, Cedar Rapids, Iowa

UNIVERSAL

CRUSHERS, PULVERIZERS, COMPLETE PLANTS, SPREADEROLLERS, PORTABLE ASPHALT PLANTS


GALION
GALION
ROAD ROLLERS
MOTOR GRADERS
THE GALION IRON WORKS & MFG. CO.
Main Office and Works: Galion, Ohio

MONOTUBES

. . . GIVE YOU BETTER FOUNDATIONS IN LESS TIME AND AT LOW COST

Up against a tight production schedule? Troubled by low head room? Plagued by widely varying ground strata?

Solve all your problems at once with MONOTUBES—the streamlined, sturdy, fluted all-steel shells that many engineers consider best for cast-in-place concrete piling.

EASILY HANDLED—Monotube steel casings are light in weight, can be handled under any conditions quickly and economically.

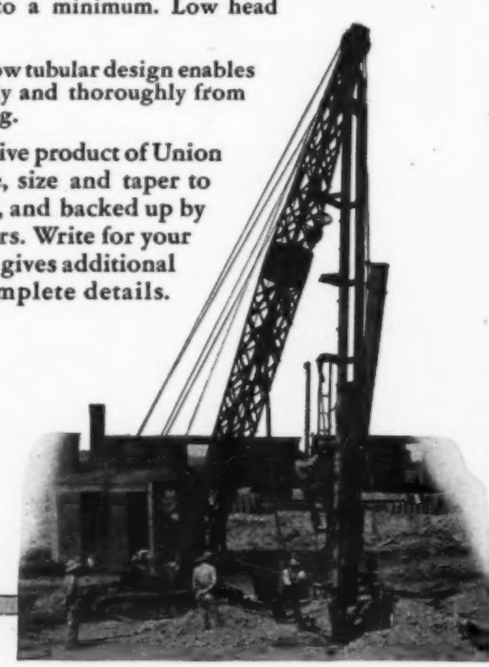
QUICKLY DRIVEN—Tapered Monotubes are so strong and rigid they require no heavy core or mandrel and can be driven with average job equipment (crawler crane, equipped with standard leads and hammer).

READILY EXTENDED—Use of Extendible Monotubes proves economic and speedy where varying ground conditions require a wide variety of lengths. Extensive testing for lengths not necessary. "Cut-off" waste held to a minimum. Low head room no problem.

SPEEDILY INSPECTED—Hollow tubular design enables you to inspect casing quickly and thoroughly from top to toe before concreting.

Monotubes are an exclusive product of Union Metal, available in a gauge, size and taper to meet all your requirements, and backed up by a reputation of over 36 years. Write for your copy of Catalog 68A which gives additional valuable information, complete details.

UNION METAL

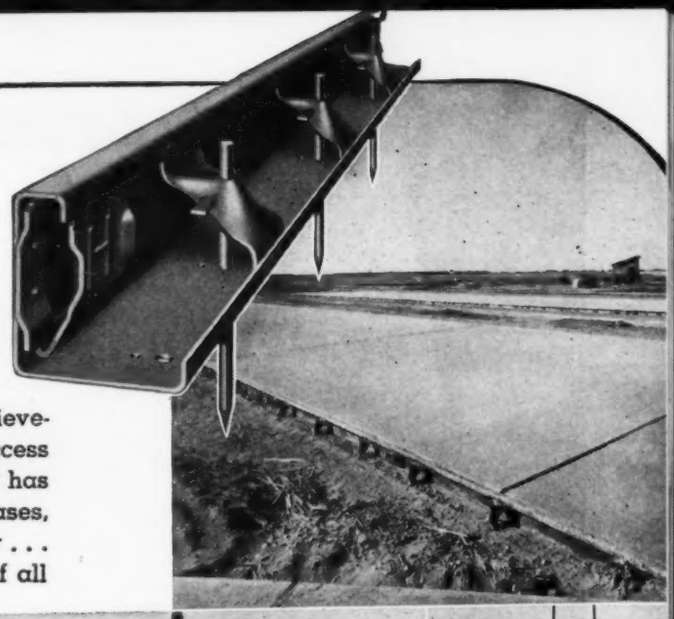


THE UNION METAL MANUFACTURING COMPANY

CANTON, OHIO

★★★★

General Contractor



e doesn't expect any stars . . . few people recognize his achieve-nts, but he and his organization are responsible for the success our Victory Construction Program. Our *General* Contractor has ilt the factories, the airports, the training centers, the naval bases, e proving grounds, the arsenals . . . *and built them in a hurry* . . . America could train and equip the greatest armed forces of all e.

ng ago he learned the value and economy concrete for vital construction. Long ago learned the value and economy of Heltzel uipment for batching, forming or placing ncrete, and long ago he learned to depend Distributor Organizations for dependable ncrete construction equipment.

day, with all the restriction orders against nstruction equipment, he knows his Heltzel stributor can, and will help him get the uipment he needs, and get it in a hurry.

your project is vital to the war effort, you n depend on your Heltzel representatives get you the equipment necessary to speed your forming, batching or placing oper-ons.

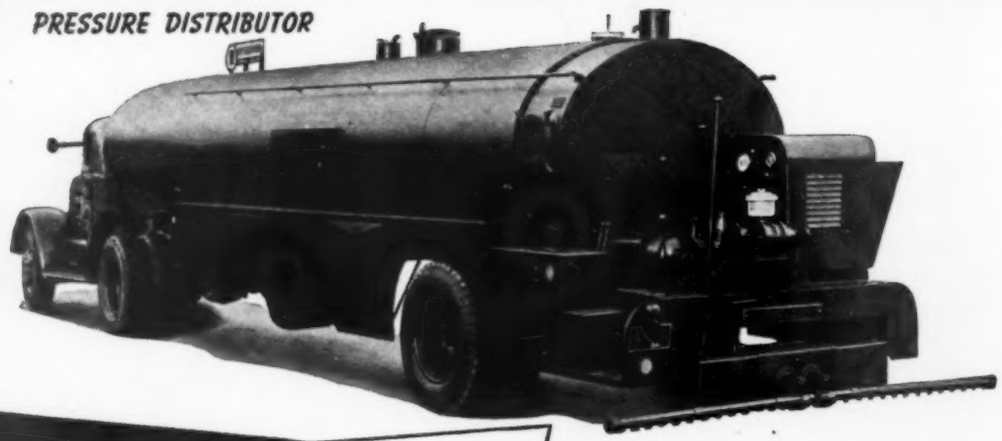
ntact him for complete details.

HELTZEL SUPERIOR CONCRETE CONSTRUCTION EQUIPMENT

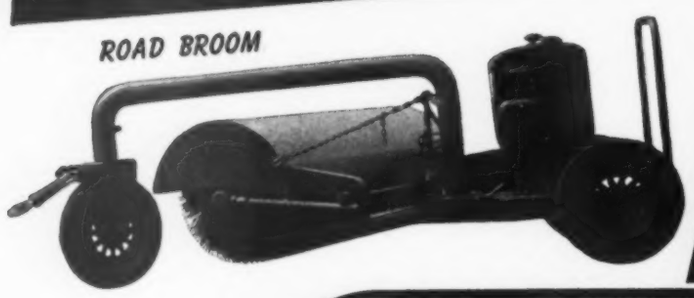
- MILITARY HIGHWAY FORMS
- AIRPORT FORMS
- CURB, CURB AND GUTTER OR SIDEWALK FORMS
- PORTABLE AGGREGATE BATCHING BINS — 30 TO 100 TONS CAPACITY
- PORTABLE AND SEMI-PORTABLE BULK CEMENT BATCHING BINS FROM 100 TO 750 BBLS. CAP.
- CENTRAL MIXING PLANTS
- CEMENT TANKS TO 1500 BBLS.
- TREMIE CHUTING
- CONCRETE FLOOR HOPPERS
- CONCRETE BUCKETS

HELTZEL STEEL FORM & IRON CO.
WARREN, OHIO · U. S. A.

PRESSURE DISTRIBUTOR



ROAD BROOM



BLACK TOP ROAD MAINTENANCE EQUIPMENT

LB LITTLEFORD

SINCE - 1900

TANKAR HEATER

SUPPLY TANK

BLACK TOP ROAD MAINTENANCE EQUIPMENT

The Littleford Trade Mark is in the fight, building and maintaining Airports, Highways, Roads, Barracks and Cantonments. Doing a job to help bring an early peace. After Victory, the Littleford "Trade Mark" will again help to make this world a better place in which to live. Littleford since 1900, has produced Black Top Construction and Maintenance Equipment, and is NOW proud to have the chance to produce for Victory.

LITTLEFORD BROS., INC., 454 E. Pearl St., CINCINNATI, OHIO

Stop TROUBLE

BEFORE IT STARTS!

With factory-trained mechanics, the right-type tools and labor-saving machines, your Allis-Chalmers dealer services your equipment quickly and economically.

Your tractors are built for the toughest kind of service . . . and they will stand up under the most severe punishment . . . but various parts will naturally wear with time. Take care of this wear promptly and you will ward off trouble. The quickest and most economical way is to have your Allis-Chalmers dealer build-up the worn parts or adjust them to shift the wear. This eliminates replacement cost, does away with waiting for parts and gives you a more efficient-operating tractor in the meantime — also saves you a major repair bill in case the worn part gives way and damages the surrounding mechanism. In addition, you help your country conserve on sorely needed materials.

Follow the Preventive Maintenance suggestions listed on this page. They are proven ways of saving money and extending the life of your tractors. Your Allis-Chalmers dealer is fully equipped to give you all these services. Get in touch with him NOW! Stop trouble before it starts!

ARMY E NAVY

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE, U. S. A.

EXTEND TRACTOR LIFE

With Preventive Maintenance

1. Give track pins and bushings a new wearing surface by turning them.
2. Alternate sprockets from right to left, or vice versa, for different wearing surface.
3. Jump drive sprocket, if necessary, to even wear on the teeth.
4. Change rollers from one side to another or interchange—particularly front rollers which receive excess wear when heavy equipment is mounted on front of tractor.
5. It is sometimes advisable to change the entire track from one side to another for a new wearing surface.
6. Build up stabilizer cranks by welding, turn them to standard size and replace bushings.
7. Weld rings to guide flange on front idler. Track-carrying face of front idler can also be welded up with rings.
8. Straighten and weld track-roller frame channels instead of replacing.
9. Weld and remachine drive sprocket shafts to original size.
10. On Diesel engines — instead of replacing sleeves, rebore and rehone to oversize. Keep all engines tuned-up . . . overhaul at regular intervals.

Get the most out of YOUR TRACTOR with

BUCKEYE CABLE CONTROL

ADDING Buckeye Cable Control to your tractor steps up its output two ways . . . first, you'll get higher output from your cable-controlled equipment with Buckeye's fast, accurate winch; second, your tractor can handle scores of new and *different* jobs with Buckeye's smooth, rugged cable power.

Using a two-drum Heavy-Duty Hoist, one drum can operate your dozer, ripper or scraper, leaving the second drum free to operate another piece of equipment or ready to handle the dozens of cable pulling, hoisting or hauling jobs that turn up on every project. Spooling 350 feet of ½" cable, the wide, husky Buckeye drum gives you over 8,000 lbs. line pull and a line speed of more than 300 ft. per minute. For hoisting jobs, your line can be reeved through single or multi-part sheaves—plenty of cable to work with, plenty of line pull for the tough ones. Simple job-made hoist frames can be mounted at the front, rear or sides of the tractor. Line may be run out directly from the drum to snake logs, pull out stalled equipment or pull cable, fencing, etc. To get the *most* out of your tractor, equip it with Buckeye Cable Control NOW!

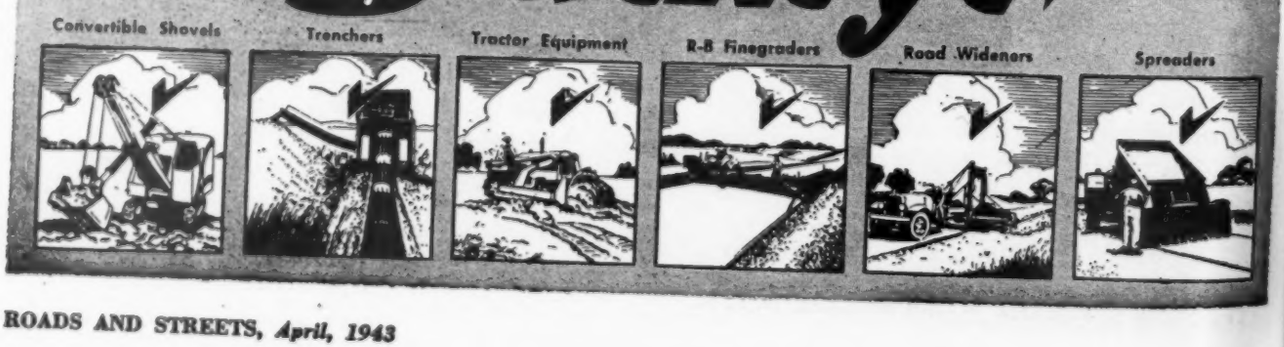
Write for specifications on Buckeye winch models to fit your tractor.

THE BUCKEYE TRACTION DITCHER COMPANY, Findlay, Ohio

WITH BUCKEYE CABLE CONTROL, YOUR TRACTORS CAN DO MORE JOBS!

Check Pages 6-7-31

Built by Buckeye



Helps keep highways SMOOTH!

PUBLIC SAFETY demands roads and streets be kept clear of ice—particularly at intersections. This constant "de-icing" is rough on concrete, often results in serious surface scaling.

Experience, however, shows that highways paved with Vinsol-treated cement may be expected to remain smooth, free from scaling, in spite of freezing, thawing, and the constant action of de-icing agents.

VINSOL*-TREATED CEMENT RESISTS SCALING

Proved Over Last 5 Years

The effectiveness of this development has been thoroughly proved over the last 5 years. For example, in a series of tests reported in one of the northern states, 61 alternate cycles of freezing, followed by thawing with ice-removing chemicals were obtained over a two-year period. In spite of these severe conditions, the Vinsol-treated cement remained practically scale-free, whereas the surface treated with normal cement showed extensive pitting.

In other sections of the snow and ice country, strips of Vinsol-treated cement were laid alongside of normal portland cement. Here again the Vinsol-treated cement showed practically no scaling, whereas the other surface was found to scale right up to the separation joints.

More Economical to Use

In addition to retaining its smooth surface, Vinsol-treated cement saves time and money in laying. It is plastic; there is less segregation of the aggregate, less bleeding and formation of mortar pockets. The result is easier spreading, faster finishing.

Easy to Obtain

You can probably obtain Vinsol-treated cement with full instructions for its use from your regular supplier. We have published a 44-page booklet, "Better Roads Ahead." Compiled from the experiences of practical engineering and construction men, it will be of value to you whatever type of job you're concerned with. Mail the coupon below for your copy.

*Reg. U. S. Pat. Off.

Specify Vinsol-treated Cement for Longer Surface Life

NAVAL STORES DEPARTMENT
HERCULES POWDER COMPANY
INCORPORATED
972 MARKET ST., WILMINGTON, DELAWARE

Gentlemen:
Please send me a copy of 44-page book, Better Roads Ahead, telling the complete story of Vinsol-treated cement.

*Name*_____

*Company*_____ *Title*_____

*Address*_____

*City*_____ *State*_____

LL-91

Roads? THEY MAKE THEIR OWN ROADS!

WALTER TRACTOR TRUCKS

THE specially designed, rugged, powerful Walter Tractor Truck is not built for paved highway hauling. The heavier the loads—the rougher the roads—the steeper the grades, the more the great power and traction of Walter 4-Point Positive Drive are demonstrated.

Walter Tractor Trucks are used for jobs that rear wheel drives can't handle—and where conventional four-wheel drives falter. For example, bucking heavy snow-drifts; hauling heavy loads through soft dirt, mud, ruts, broken terrain and up stiff grades, as in off-the-road and construction work; pulling enormous trailer loads in coal and iron mines, logging and similar work.

To accomplish this, Walter Tractor Trucks embody such features as patented automatic lock differentials, suspended double reduction drive, tractor type transmission and many others. If you have punishing hauling jobs, write for literature explaining why Walter Tractor Trucks are best designed and constructed to handle them.

WALTER MOTOR TRUCK COMPANY
1001-19 Irving Ave., Ridgewood, Queens, L. I., N. Y.

BOOM OPERATION PLUS HOISTING WHILE SWINGING *Saves Time...*

It's no joking matter this idea of getting the scrap in the scrap. It's a must for '43. Even the boys on the battlefield have special salvage units which lug the scrap metal away from the combat areas. And the war isn't held up while they do it . . . bombs fly . . . bullets whiz by . . . shells burst in air . . . as they hurry the scrap back to the mills to make a new fighting unit. Our soldiers know how vital this scrap is in attaining VICTORY. So let's all get our scrap into the scrap today. Casualties will be cut in two . . . scrap piles will swell . . . and Koehring Cranes will help speed up a victory with its boom operation plus hoisting while swinging.

KOEHRING COMPANY • *Milwaukee, Wisconsin*

KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

WAR begins with AGGREGATE!

655,000 TONS
roll out of this
ONE IOWA MOROK PLANT
for
M. O. WEAVER, Inc., Des Moines, Iowa
—all for the War Effort!

WAR begins with aggregate! It is the basis of every foundation — for plant expansion, for flying field, for cantonment, for arsenal and hospital.

M. O. Weavers Morok plant is one of the many Iowa Cedarapids portable crushing plants that is producing for Victory. 655,300 tons of material rolled out of this plant in 1942 in spite of the fact that it was moved four times from widely divergent points. The monthly average output for the periods when the plant was actually on the job location, was 73,000 tons. That is enough material to provide 25 runways 200 ft. wide, a mile long and 6 inches thick.

Output like this gives you some idea what it means to have an Iowa Cedarapids plant — it means a smooth running job, free from hitches and giving easy portability when you are faced with a move — Iowa Cedarapids plants keep-a-runnin'.

These are things that are going to be mighty important after the "Duration". They are going to play a real part in the success of post war contracts. The Iowa line is complete and can be engineered to meet any aggregate production problem either from the standpoint of output or character of materials for either an entire plant or any part of a plant.

Come to Headquarters for Aggregate producing equipment.

IOWA MANUFACTURING CO. Cedarapids Built by IOWA **Cedar Rapids,**

HEADING HOME with CONFIDENCE !

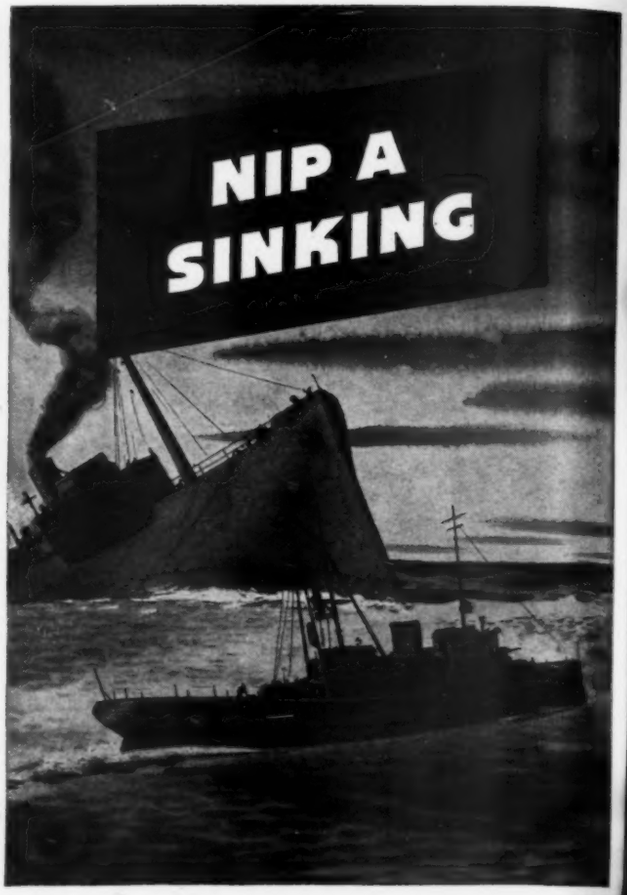
OFFICIAL U. S. NAVY PHOTO

It is difficult to realize that the influence of HUBER equipment reaches far out to sea. It is true, however, for bombers on patrol must return to their home bases . . . and HUBER Speed-Scoops, Rollers, and Bulldozers are doing a real job of keeping home bases fit for our fighters. This is one of HUBER'S many contributions to the war program. » »

THE HUBER MFG. CO. ● MARION, OHIO

HUBER SPEED-SCOOP

ROLLERS ● BULLDOZERS



. . . the Navy uses RPM DELO!

The men who fight in U. S. Navy submarines believe that Japan is entitled to half the Pacific—the bottom half! That's where they're sending thousands of tons of enemy shipping.

But this isn't a one-way war. Many of our ships have been damaged, too — and would have sunk except for rescue by one of the Navy's ocean-going tugs. These sturdy ships are vital units of the Fleet, constantly on the alert to hold down our losses by towing crippled ships to bases where they may be repaired to fight again.

Submarines and tugs of the Navy both use RPM DELO to lubricate their powerful Diesel engines. So do other types of Navy craft. Day in and day out, RPM DELO in Navy Diesels is meeting and beating some of the toughest lubricating problems in history.

In *your* Diesels, too, RPM DELO will give dependable protection, freedom from ring-sticking and sludge trouble. No other oil combines its anti-oxidant, cleaning and non-corrosive properties. Switch now to RPM DELO.

RPM DELO
DIESEL ENGINE LUBRICATING OIL

ORDER RPM DELO FOR YOUR DIESELS

RPM DELO is marketed under the following names:
RPM DELO • Caltex RPM DELO • Kyso RPM DELO
Signal RPM DELO • Imperial-RPM DELO • Sohio RPM DELO
CONCENTRATE
Ask your Diesel engine manufacturer or distributor for the RPM DELO supplier in your vicinity

STANDARD OIL COMPANY OF CALIFORNIA

For EARLY SPRING Road Jobs Like These... Make Full Use of Your FWD's!

★ Pulls scarifier for raising buried binding material—mixing soil constituents—loosening irregular hard pan — displacing oversize material.

★ Pulls leaning-wheel grader for cutting down backslopes — widening of traveled roadway — removal of slides — deepening gutters.

★ Removes ice with underbody scraper.

★ With underbody blade — removes washboard surfaces, ruts and sinkholes.

★ Hauls markers, signs, etc. for replacement.

★ Reclaims valuable surfacing material from the shoulder.

★ Hauls gravel, sand, asphalt heaters in pavement patching.

★ Hauls snow fence to storage.

★ Hauls materials for patching hardened road surfaces.

★ Hauls materials for replacement on wearing course.

★ Compacts surface materials with flat blade.

★ Hauls men and materials to remote locations.

FWD Model H G ALL-SEASON Maintainer — the most advanced four-wheel-drive truck built in America. A solid year of proving-ground tests has shown it to be a real truck engineering achievement, outstanding in pulling power, flexibility, and load-carrying ability.

• Listed above are just a few of more than 60 road conditioning and maintaining jobs that can be done faster — better — at far less cost with your FWD Model HG All-Season Maintainer.

We print them here so you do not overlook the wide range of jobs which your FWD trucks will take in stride.

Now — when existing truck equipment must deliver more than the expected in service and long life—highway men who operate FWD trucks appreciate their extra stamina — ruggedness — endurance — and the high quality of steels that go into their construction.

More than ever before, highway departments depend on their FWD trucks for their sustained and superior performance — their four-season usefulness — their recognized capacity to conserve gas — oil — tires — replacements — to hold all operating and maintenance costs to the very minimum.

THE FOUR WHEEL DRIVE AUTO CO.
CLINTONVILLE, WISCONSIN
Canadian Factory: Kitchener, Ont.

IN EVERY FIELD WHERE TRUCK QUALITY IS PUT TO THE TEST — FWD's STAND UP!

COMMERCIAL

CONSTRUCTION

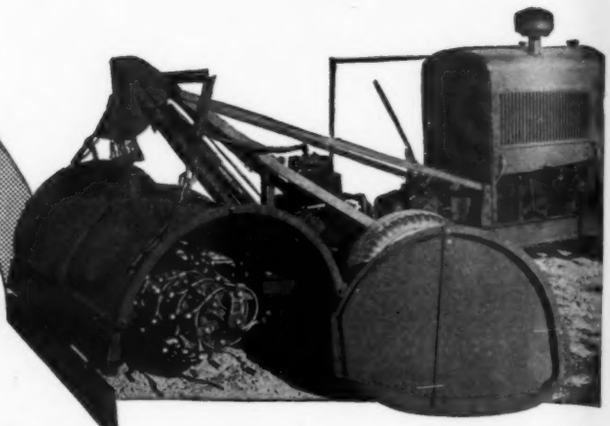
UTILITIES

OIL FIELDS

FWD TRUCKS

MILITARY

For building
BETTER HIGHWAYS
to the **SKYWAYS**



ROTOTILLER

TRADE MARK REG. U.S. PAT. OFF

ROADMAKER

SOIL STABILIZATION is speeding military operations wherever our armed forces are or go. Using local materials or any others available, highways, landing strips and airfields can be built or repaired faster, better, more economically.

ROTOTILLER Roadmaker is the pioneer "3-in-1 Rotary Action Machine" especially designed and built for soil-cement and soil stabilization work. The "3-in-1 Rotary Action" assures more accurate control in both wet and dry mixing operations as well as more thorough pulverization of materials. The fast-revolving, self-sharpening tines thoroughly mill the earth from top to bottom to a depth of 12 to 18 inches *in one operation.*

GET THE FACTS on this 1943 job-tested ROTOTILLER Roadmaker. Write for descriptive literature.

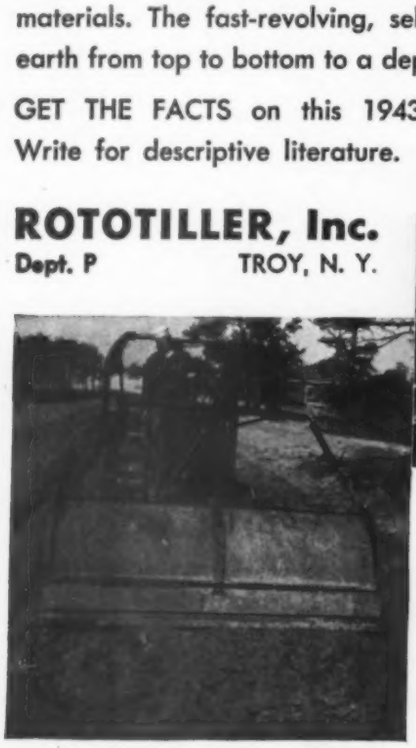
7 STAR FEATURES

1. Improved, self-sharpening, single unit spring-tines.
2. 4-speed transmission permits use for scarifying as well as mixing.
3. Flexible tilling unit gives fast, easy operation; sharp turns with safety.
4. Weight of tilling unit variable to suit conditions; lessens wear.
5. Depth of operation regulated to within one-half inch.
6. Powerful 6-cylinder Chrysler motor operates economically on 1 to 2½ gallons of gasoline per hour, depending on conditions.
7. Strong, dependable ROTOTILLER Roadmaker cuts 6 ft. wide, 12 to 18 inches deep, with complete ROTOTILLAGE across entire width of cut — no untilled areas.

•

Post war plans undoubtedly will call for thousands of miles of soil-cement and oil stabilized secondary roads. Returning soldiers will find economic security in this work. Then, as now, ROTOTILLER Roadmaker will serve faithfully and well.

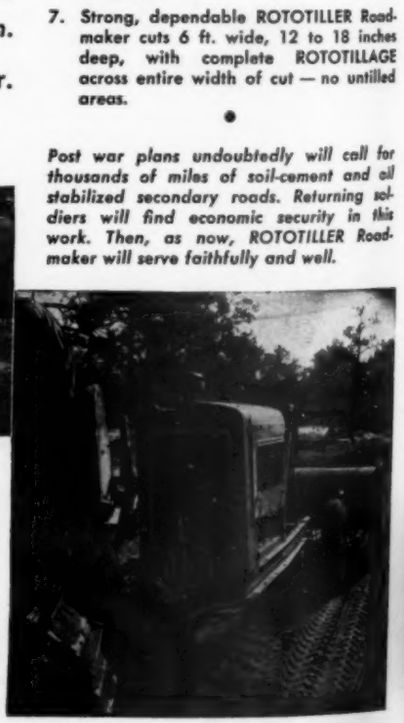
ROTOTILLER, Inc.
Dept. P TROY, N. Y.



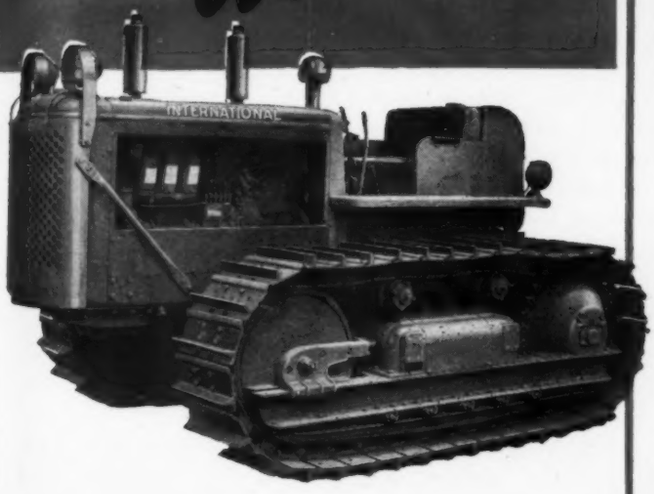
ABOVE: Mixing clay and sand to depth of 12 to 14 inches on experimental project for U. S. Naval Construction Battalions (Seabees). Note fine pulverization and uniformity of mix.

LEFT: Scarifying to rebuild old road.

RIGHT: ROTOTILLER Roadmaker takes sharp turns with safety without taking tines from ground or stopping tillage unit.

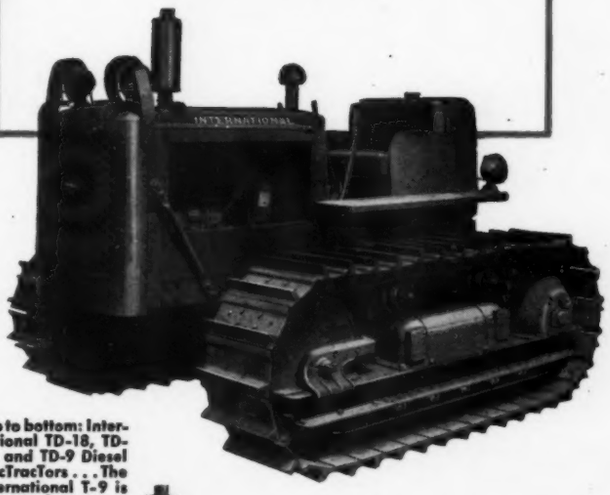


OUR "1943 Models" are Dedicated to Victory



INTERNATIONAL
VICTORY TracTracTors

Built to Victory Specifications—for Release to Users on Essential Construction Work



Top to bottom: International TD-18, TD-14, and TD-9 Diesel TracTracTors . . . The International T-9 is not shown.

NORMALLY International Harvester would be announcing new 1943 International TracTracTors about this time of year. But this is wartime, and traditional "new models" have been discontinued for the duration.

Just the same, there's a great line of TracTracTors rolling off the assembly lines. We call them Victory TracTracTors. They're all built to Victory (military) specifications. Most of them are going to the Armed Forces. A limited number are available for civilian use on *essential construction jobs.*

Users who qualify for these Victory TracTracTors get machines equipped as shown here. Much of this equipment is normally considered as "attachments." Today it is "standard." These tractors are frozen in design, and users get the benefit of *extra equipment to do essential war-winning jobs.*

Ask the International Industrial Power dealer about Victory TracTracTors and your eligibility. Meanwhile, take good care of the Internationals you have. Rely on International Service to help keep them operating efficiently. Work out a systematic preventive maintenance program with the International dealer. Yours for Victory.

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago, Illinois

POWER FOR VICTORY
INTERNATIONAL HARVESTER

BUY MORE WAR BONDS

NO PREVIOUS WAR EVER SAW A ROAD-BUILDING JOB LIKE THE NEW ALCAN HIGHWAY...

nor the modern *Preformed wire rope*

THAT HELPED BREAK ALL RECORDS

Short cut to Japan—this 1,681-mile, 30-foot wide military artery for troop transport and supplies—a colossal task, bridging and crossing 200 streams, was completed in advance of schedule.

And every foot of the way, helping to accomplish the impossible, Preformed Wire Rope was on the job—lifting and swinging the giant shovels and grab-buckets biting away the tons of rock and soil, manning the booms that swung bridge-timbers and plates into place, winching trucks out of gullies and gravel pits.

Preformed Wire Rope—with its greater flexibility and stamina, easier handling, longer life, fewer shutdowns for replacements, and cost reducing—*proved* through years of peacetime performance in industry that it was made to order for the toughest wartime jobs.

Ask your own wire rope manufacturer or supplier

Ability to travel fast over any kind of terrain is the first qualification for an airport fire truck. Minutes may save precious lives and planes. Neither mud, nor sand, nor snow must be allowed to delay the arrival of the truck, at the scene of action, when accident, sabotage or enemy bomb takes its toll.

That is why Marmon-Herrington *All-Wheel-Drive* converted Ford trucks are so widely specified by the military, and by informed civilian officials, for this service. They get through, where conventional drive trucks fail, and being the speediest, most maneuverable all wheel drive trucks on the market, *they get through fast.*

Users of these vehicles, in the oil fields, in road building and maintenance, in public utility services, logging camps, mining and general construction, etc., will find still greater advantages in Marmon-Herrington trucks when the war is won. Let your bond purchases help speed that day!

MARMON-HERRINGTON

All-Wheel-Drive

MARMON-HERRINGTON CO., Inc., INDIANAPOLIS, INDIANA

Cable Address: MARTON

New PAVER VERSATILITY for tomorrow's Jobs

THE old Third Avenue elevated becomes a highway of tomorrow—a modern four-lane elevated express highway that will speed motor traffic from New York City to South Brooklyn.

Now other municipalities with elevated structures are studying the costs of redesign and reconstruction for the day when steel is available again.

Ideas like this are only indications of the great mass of work that peace time needs are going to generate. For that time, there will be an improved MultiFoote, a paver proved in the "highball" service of war effort—a paver with new flexibility — a paver with an elevated boom capable of handling high output to elevated structures—and fast—a paver capable of more than roadwork only.

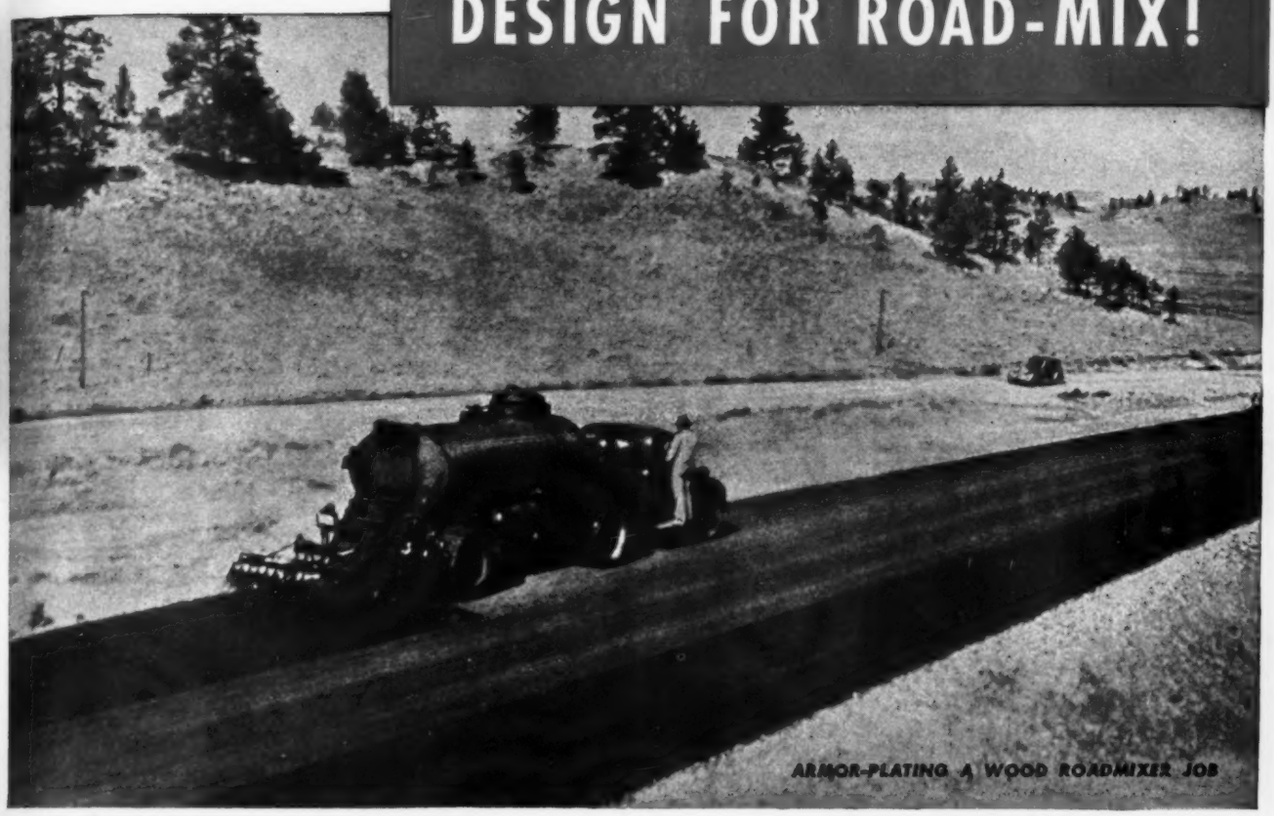
In the MultiFoote, you will have a machine that will make post-war contracts more successful in spite of the increased post-war competitive angle—and remember, there are more MultiFoote Pavers in service than any other make.

THE FOOTE COMPANY, INC., Nunda, New York

MultiFoote Paver placing concrete for the old Third Avenue Elevated, New York City.

MULTIFOOTE
CONCRETE PAVERS

DESIGN FOR ROAD-MIX!



ARMOR-PLATING A WOOD ROADMIXER JOB

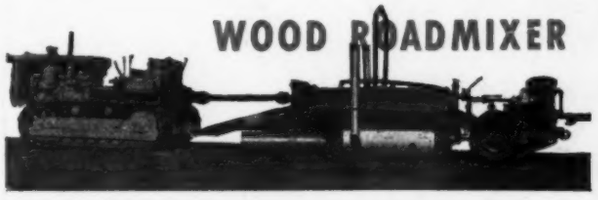
Use Local Materials, Save Trucks, Freight, Hauling Equipment and Manpower... *And Get Faster Pavement Construction*

The road-mix method of pavement construction utilizes native and local materials lying *at or near the job.* These materials are picked up by a traveling mixing plant, mixed with liquid binder and deposited in windrows for spreading and finishing.

Road-mix methods eliminate or largely reduce hauling of aggregate, use fewer pieces of equipment, and far less manpower than ordinary methods of pavement construction. Road-mix methods deliver greater production of top-quality paving at far less cost.

Road-mix methods add up to more miles of paving for your tax dollar.

Design your next job for road-mix, whether it be a road, street, highway, airport, landing strip, or *any* paving job.



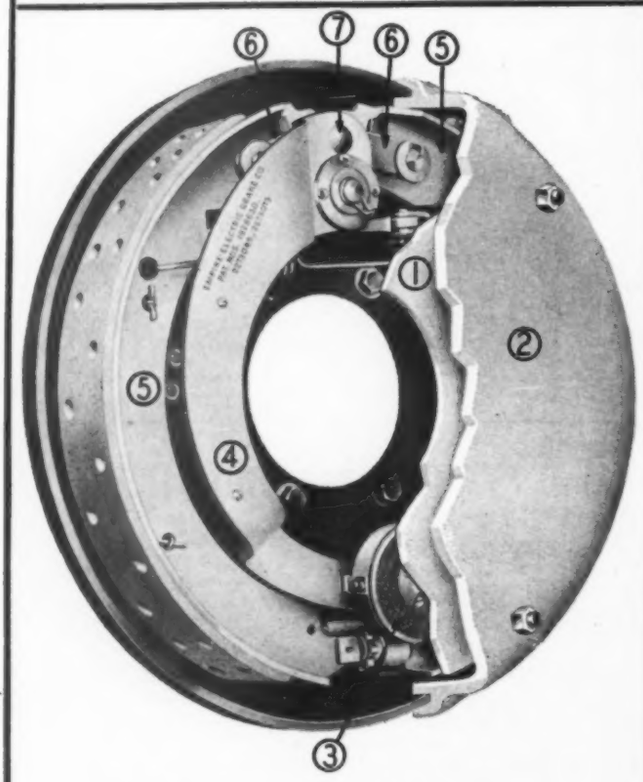
A COMPLETE TRAVELING MIXING PLANT — The original and leading traveling plant method of rapid, low-cost construction of all types of asphaltic mats and stabilized bases, either emulsion or soil-cement. Is pulled and powered by any of these crawler tractors: Caterpillar D-8, RD-8, Allis-Chalmers Model L, LO or HD-14. Only other piece of equipment needed is binder supply truck which is towed behind the Wood Roadmixer. Tractor can be disconnected for other work when not in use with the Wood Roadmixer. The Wood Roadmixer can be hauled on a truck from job to job, or towed by a patrol for short moves... Absolute volume control on aggregate and liquid binder, regulated mixing action to fit conditions of job... Add a Wood Roadmixer to your present equipment. It costs less to buy, less to operate and less to maintain than any other proven mixer... Design and build Road-mix!

Write for detailed and illustrated Wood Roadmixer bulletin, "The Fastest Method of Low-Cost Paving."

WOOD ROADMIXER

Wood Manufacturing Co. • 816 West 5th St., Los Angeles, California

Does what you're making need Better Braking?



The MAGDRAULIC Electric Brake consists of a Backing Plate, a Brake Shoe mechanism, a Lever, an Electromagnet, and an Armature Plate, all housed within the Brake Drum.

1. The Armature Disc, which is a circular flat steel plate is secured to
2. The Brake Drum and rotates with it.
3. The Electro-magnet is supported on
4. The end of the Lever and is always in light contact with the Armature Plate. The Lever is pivoted at a point between
5. The ends of the Brake Shoes.
6. Brake Shoe links Bearing against
7. The Lever Pin open the Brake Shoe, and apply the brake when the lever is moved in either direction.

MAGDRAULIC Electric Brakes are made in several sizes and can be easily adapted. Write at once for new Data Book.

Don't say NO until you've exhaustingly compared the MAGDRAULIC Electric Brake with the one you are now using.

The extraordinary torque of MAGDRAULIC Electric Brakes is developed within the brakes themselves. This super-power braking force that we call "Electric Squeeze" is particularly effective in handling high speeds and power overloads, without auxiliary booster equipment.

If your present brake can't do that you face an obligation to yourself and your product to find out quickly how MAGDRAULICS can fit into your picture . . . right now, or, for a post-war change.

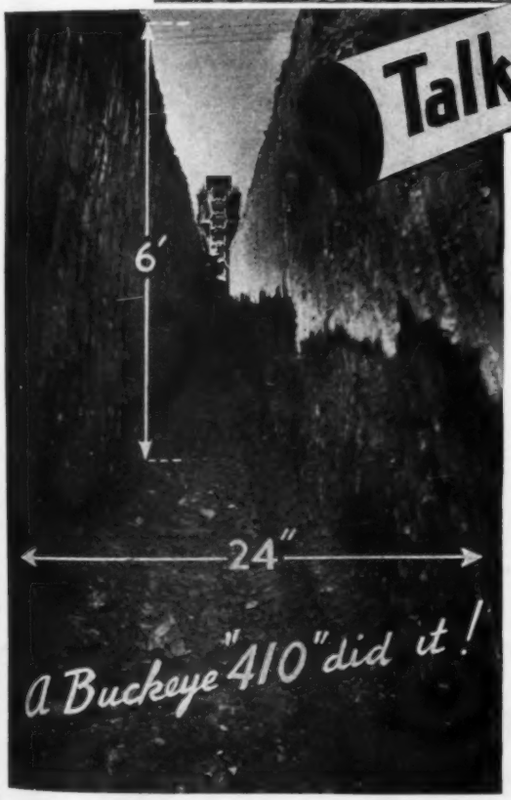
Our Ack-Ack Boys could tell you plenty about this powerful new electric brake!

MAGDRAULICS brake these heavy anti-aircraft gun carriages. On many fronts, in bitter cold and broiling sun, over rocky spine-jarring terrain and through hub-deep mud they are standing up to a test that no home-front proving ground equals.

EMPIRE ELECTRIC BRAKE CO., • NEWARK, N. J.

Talk About Saving Manpower!

With more machines like the fast, compact, "one-man" Buckeye "410" boom type trencher in use, Paul McNutt's War Manpower Commission won't have so many sleepless nights trying to figure how to fill three jobs with two men.



The "410" is the result of over 50 years of trencher engineering experience. Only 80″ high, 57″ wide (7′10″ including power-shifting conveyor). Handles like a truck, yet rugged enough to stand up under continuous cat-skinning. Single lever steering; both crawlers driven; wide range of cutting feeds—6″ to 38′ per minute; bucket line speeds 31′ to 189′ per minute; road speeds up to 2.67 miles per hour. Hydraulically controlled boom, forged bucket chain with patented splined bushings and reversible pins. Easy to transport. *Man, what a trencher!*

Comparatively new, yet dozens of them are in there pitching for Uncle Sam—digging clean, round bottom trench for drainage, sewer, water, gas and steam pipe and underground cable at airports, army camps, war plants, housing projects—at home and abroad—doing the work of a whole gang of men day after day!

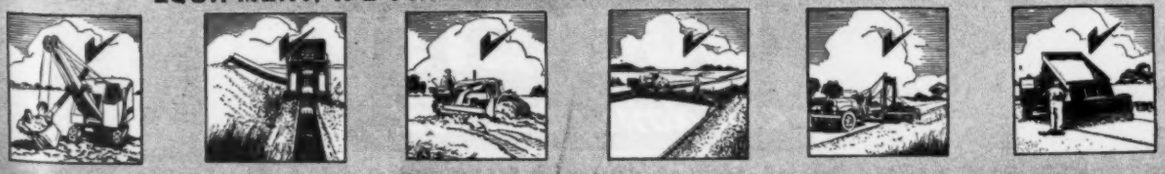
BUCKEYE TRACTION DITCHER CO.
Findlay, Ohio

★ Wars demand scrap.
Invest in War Bonds.
No laying down on jobs.

50 YEARS OF PROGRESS BUCKEYE 1893 1943

Buckeye

CONVERTIBLE SHOVELS, TRENCHERS AND BACKFILLERS. TRACTOR EQUIPMENT, R-B FINEGRADERS, ROAD WIDENERS AND SPREADERS



Check Pages 6-7-14

Tanks move doggedly forward wreaking havoc on the enemy but their speed is necessarily slower than trucks and their span of continuous service considerably more limited.

So they crawl up on Rogers Trailers and are moved quickly to the line of combat—or from it when repairs or reconditioning becomes necessary.

Thus, the effectiveness of an important combat unit is increased manifoldly by these non-combat vehicles.

ROGERS BROTHERS CORP., ALBION, PENNA.

IF ENGINE POWER IS NEEDED . . .

Here's Your Engine!

Machine designing engineers, contractors, farmers, oil operators and industrial users are more and more recognizing the amazing versatility, heavy-duty dependability, fit-the-machine compactness, light weight and economy of WISCONSIN AIR-COOLED ENGINES. Specify these engines for *today's* work as well as for *tomorrow's* applications.

Power range: 1 to 35 hp., 1 and 4-cylinder types. Model VE-4, 22 hp., 4-cylinder V-type illustrated.

MOST POWER per POUND

WISCONSIN MOTOR Corporation

MILWAUKEE WISCONSIN, U. S. A.

World's Largest Builders of Heavy-Duty Air-Cooled Engines

ASPHALT

for

HIGHWAY WIDENING AND MAINTENANCE

As an emergency measure, highway widening can provide adequate capacity for handling traffic flow increased by defense activity. This saves the delay and expense of constructing new roads which may or may not be required in normal times.

Asphalt construction offers the fastest and simplest method of getting results. Not only can it use local aggregates, but Asphalt can be laid with little interference to traffic.

Wherever Standard Oil Asphalt products are sold, there is an Asphalt representative who can give you full information about these and other uses of Asphalt. Write . . .

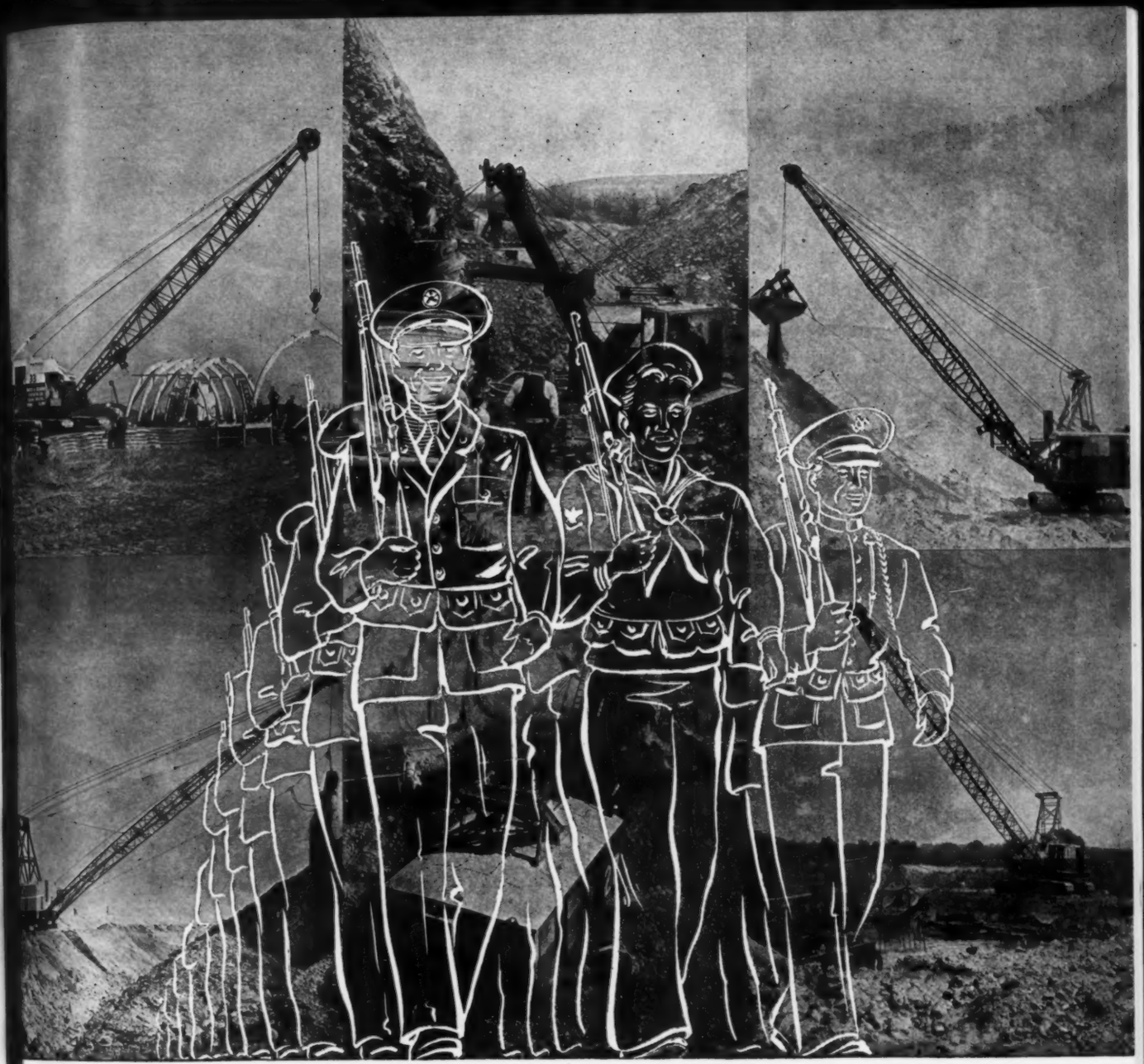
STANDARD OIL COMPANY (Indiana)

910 SOUTH MICHIGAN AVENUE, CHICAGO

THE OWEN BUCKET CO., · Breakwater Avenue, Cleveland, O.

Branches: NEW YORK • PHILADELPHIA • CHICAGO • BERKELEY, CAL.

A MOUTHFUL AT EVERY BITE



OLVING THE MAN POWER PROBLEM ON THE ATERIAL HANDLING FRONT . . . . .

MARIONS' responsibilities are four-fold today. They must clear the way for war plants, army depots, airports, war housing projects, camps and the like. They must dig and ndle vital raw materials to keep our vast war machine rolling to tory. They must build ships, load and unload cargoes. They st release men from the material handling front to ease the man wer shortage elsewhere. That these jobs are being done well is nfirmed by MARION records of performance. Twenty-four hour edules pay tribute to half-a-century of sound engineering.

E MARION STEAM SHOVEL COMPANY, Marion, Ohio, U. S. A.

MARION

SHOVELS • DRAGLINES • CLAMSHELLS
CRANES • PORTAL CRANES • WALKERS

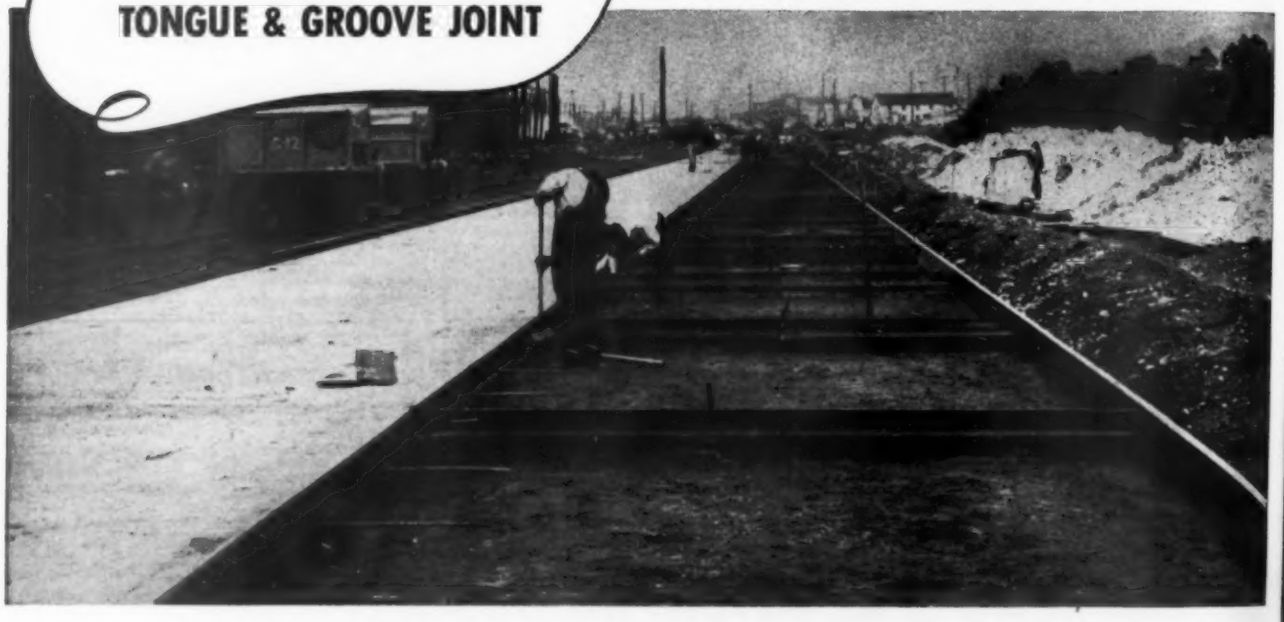
WORKING FOR VICTORY — DIGGING — Coal • Magnesium
Iron Ore • Copper Ore • Bauxite • Manganese • Nickel
Molybdenum • Sand & Gravel • Clay
MATERIAL HANDLING — Shipbuilding and Cargo Loading
BUILDING — Airports, Ordnance Plants Arsenals, Army
Camps, Marine Bases, etc.

KEEP 'EM ROLLING

But keep it smooth!

KEYSTONE

TONGUE & GROOVE JOINT



USE THE TONGUE AND GROOVE JOINT FOR MAXIMUM LOAD TRANSMISSION

Motorized giants roll heavily over the highways from coast to coast. Military and commercial vehicles alike must keep rolling and on schedule. They too have a battle to fight.

Half of their battle is won by the engineers and contractors who plan and build the highways. Smoothness for driving safety is possible only with expert road planning and good material selection.

Small wonder that they specify Keystone Mastic Board tongue and groove joints for both longitudinal and transverse joints. They are specially designed to provide maximum load transmission. The trapezoidal tongue and groove feature allows normal expansion and contraction without buckling or "blow-ups". Keystone tongue and groove joints have been tried and tested. They bear the full approval of the U. S. Engineers, Navy Department and the Bureau of Public Roads.

***Keystone Mastic Board Center Strip** is formed from ageless asphalt and mineral fillers. It is absolutely waterproof, flexible and easily handled. No critical materials are used and cost per lineal foot is extremely low. Write for complete information and estimates today.*

Keystone

A DIVISION OF THE AMERICAN-MARIETTA COMPANY

KEYSTONE ASPHALT PRODUCTS COMPANY · 43 E. OHIO STREET · CHICAGO

You Bet-I'm Busy!

but not too busy to keep my equipment in A-1 shape!

With new machines and replacement parts hard to get, it's practical patriotism, as well as good business, to adopt a regular schedule of inspection, lubrication and maintenance of your present equipment. . . . Keep your MICHIGAN Mobile CRANES in shape to carry on under wartime pressure.

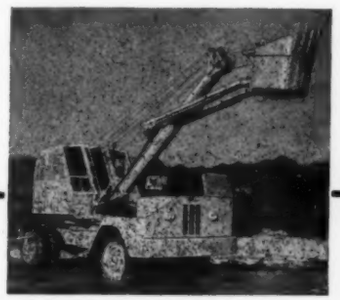
CHECK THESE VITAL POINTS REGULARLY:

- **Power Take-Off:** Inspect housing weekly for proper oil level. Use SAE No. 250 in summer; SAE No. 140 in winter.
- **Hoist, Crowd, Intermediate and Swing Shafts:** Remove and repack bearing retainers every six months. When machine is worked longer than normal hours, repack retainers more frequently.
- **Boom Point Sheave Bushings:** Grease daily through high-pressure fittings. Inspect sheave flanges for wear. Sheaves in good condition will contribute to longer cable life.
- **Cables:** Inspect regularly for wear. Apply lubricant by brush as required.
- **Main Drive Chain:** To eliminate chain slap, add shims under hoist shaft support brackets.
- **Clutches (Hoist, Crowd, Swing):** To adjust, remove cotter keys and tighten the three nuts located on extreme diameters of clutches to an even, snug pressure. Back nuts off five notches and replace cotter keys.

Our engineering staff is ready to offer its services in helping you solve your lubrication and maintenance problems.

Write today. . . . Ask for Bulletin RS-43.

Model T6-K Michigan Mobile Shovel-Crane, ⅜ yard capacity. Convertible to standard front-end attachments.



AIR CONTROLLED

MICHIGAN

POWER SHOVEL CO.

BENTON HARBOR, MICHIGAN

WHEN the Chief Test Driver here at Ward LaFrance turns one of our whopping big ten-ton Tank-Recovery Wrecker units over to the Army, he *knows* it's good. One of the biggest things on wheels in any army, this wrecker has to go places trucks never went before — because it's built to recover disabled tanks.

Before the Army inspector tests these babies, Ward LaFrance puts them through gruelling paces that would exceed the endurance of less sturdy brutes. This before-delivery test under full load is unique with Ward LaFrance . . . typical of the way we do things here.

When the war ends and you want a tough truck built for a special job, just check the performance of these Ward LaFrance heavy wreckers. Records are being made right now under the worst possible conditions, all over the world.

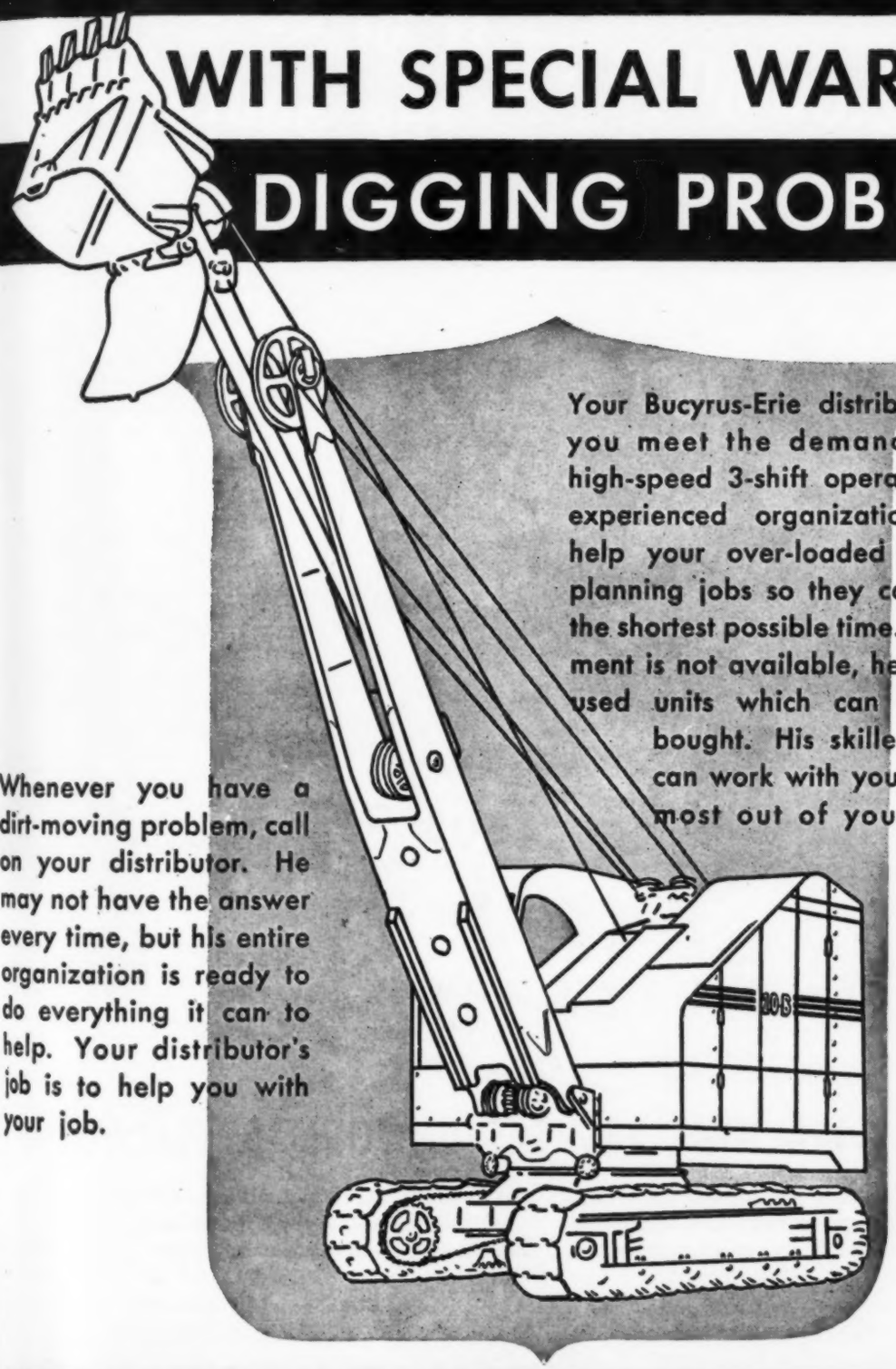
WARD LAFRANCE TRUCK DIVISION

★ GREAT AMERICAN INDUSTRIES ★

Ward LaFrance

ELMIRA, NEW YORK

LET YOUR DISTRIBUTOR HELP WITH SPECIAL WARTIME DIGGING PROBLEMS



Your Bucyrus-Erie distributor can help you meet the demands of today's high-speed 3-shift operation. His job-experienced organization can often help your over-loaded executives in planning jobs so they can be done in the shortest possible time. If new equipment is not available, he may know of used units which can be rented or bought. His skilled service men can work with you in getting the most out of your equipment.

Whenever you have a dirt-moving problem, call on your distributor. He may not have the answer every time, but his entire organization is ready to do everything it can to help. Your distributor's job is to help you with your job.

ARMY E NAVY

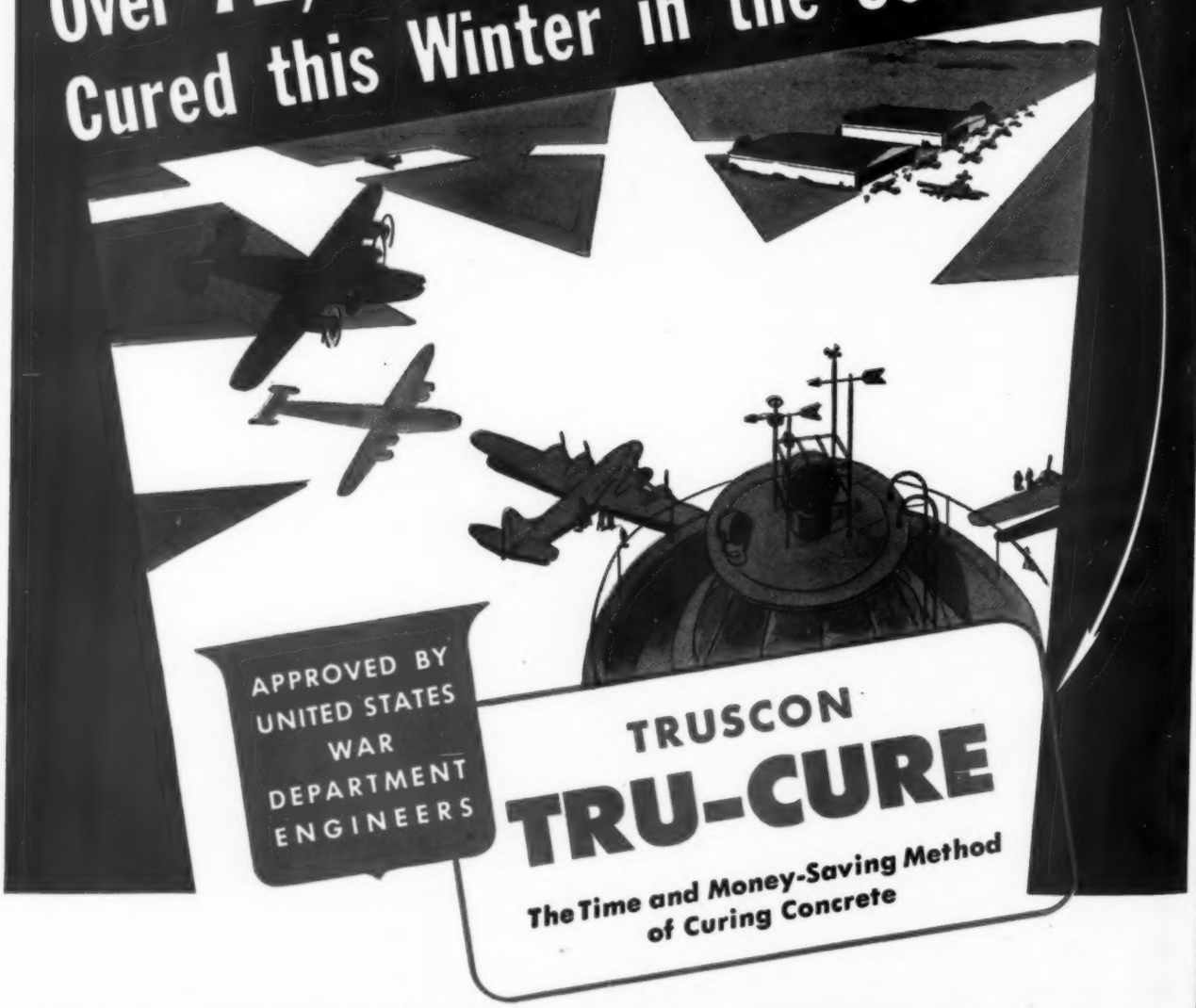
Bucyrus-Erie employees have accepted the award of the Army-Navy "E" as a challenge to keep production rising. * *

Bucyrus-Erie

SOUTH MILWAUKEE • WISCONSIN • U. S. A.

SPRAY IT ON—AND THE JOB IS DONE

Over 72,000,000 sq. ft. of Concrete Cured this Winter in the South with



APPROVED BY UNITED STATES WAR DEPARTMENT ENGINEERS

TRUSCON

TRU-CURE

The Time and Money-Saving Method of Curing Concrete

NEW SPRAY MACHINE ASSURES UNIFORM APPLICATION

TRU-CURE application methods *now* assure absolutely uniform spreading of the curing compound over *each square ft.* of concrete even on windy days. It eliminates uncertainties heretofore associated with such applications. This method involves a special machine (patent pending) developed by **TRUSCON** engineers which operates from a bridge spanning the work.

TRUSCON TRU-CURE meets the emergency war requirements of speeding up concrete construction and helping out on man-power shortage. It assures stronger, harder and longer wearing concrete because of complete curing.

Applied by spray immediately after finishing, **TRUSCON TRU-CURE** forms a practically water-proof film. This film holds in the original mixing water in the concrete, thus insuring uninterrupted and complete curing of concrete. No need for paper, burlap, cotton mats or other bulky curing material. On actual laboratory tests **TRUSCON TRU-CURE** provides over 96% of water retention at 100° F. in the first twenty-four hours.

WRITE FOR LITERATURE to Department R-6 for information on the special Application Machine and this advanced method of curing concrete.

TRUSCON LABORATORIES DETROIT MICHIGAN

ROADS AND STREETS

April, 1943, Vol. 86, No. 4

Ohio Maintenance Geared to Wartime

Unique Snow and Ice Patrol, priority basis for repair funds, one-day foremen schools, are features of Ohio's $15,000,000 state road maintenance program

By H. D. METCALF

Chief Engineer, Bureau of Maintenance, Ohio Department of Highways

STARTING off with a series of schools for maintenance foremen the Ohio Department of Highways was in full swing by late March on the most intensive maintenance program in many years. Ohio's task is a formidable one this year, what with reduced man-power, equipment and material shortages, and budget restrictions. On top of everything, Nature decided to be a particularly bad actor, and the unusually severe winter and wet spring, coupled with record-breaking flow of freight tonnage over many routes, have threatened many hundreds of miles of roadway with destruction.

Ohio's maintenance bill in 1942 was about $15,000,000 and a similar amount will be required this year to do a minimum job of preventive maintenance, if the state roads are to be preserved. As in past years, a considerable amount of contract repair and surface treatment work is planned. It is expected that contractors will be available; equipment and workers will be the problem. Available funds and facilities will be rigidly controlled on a priority system, which was set up two years ago giving various roads priority ratings as follows:

1. Strategic network and other roads carrying over 3,000 vehicles daily average.
2. Roads with 2,000 to 3,000 average count.
3. Roads with 1,000 to 2,000 average count.
4. Roads with 600 to 1,000 average count.
5. Light traffic sections (under 600).

Types of Maintenance Work

The aim of the department is to maintain 365-day service on all roads. To this end, some surface repair work has been continued all winter. Bituminous patches were placed in freezing weather wherever a "stitch in time" would save trouble later. Holes were dried out with a blow torch, and pre-mixed patching material applied. During the winter when commercial pre-mix plants were closed down, some maintenance districts kept a small mixer in the garage, where a limited supply of mix could be made up and held for emergency spotting.

This spring all the resourcefulness and ingenuity of the maintenance men will be taxed to the uttermost. A spring break-up, the worst for years, a shortage of labor especially skilled labor, difficulties in obtaining materials and repair parts coupled with a shrinkage of funds are a few of the problems. To meet them calls for the light skin patching or light surface treatment of many miles of black top roads; heavier treatment or resurfacing of older roads; treatment of newer concrete pavements with linseed oil emulsion to prevent scaling caused by chemical thawing agents (this operation to be stepped up, depending on availability of lin-

Corner of the main morning session—Ohio's all-day road foreman school, the 11th division, New Philadelphia.

seed oil); and undersealing of "pumping" pavement joints by "mud jacking" with asphaltic cement—begun last year—will continue as an economical form of preventive maintenance. Widening of 18-ft. pavements normally continued each year will not be done. Some bituminous surfaces on lower priority highways may have to revert to traffic bound for the duration. These and many other adjustments and alterations in our normal procedure for spring maintenance will be necessary to meet the situation.

Snow and Ice Patrol

A feature in Ohio which has paid real dividends is its Snow and Ice Patrol. This state-wide organization is in operation from December 1 to April 1, and can be put in effect at any other time on short notice by telegram in event of floods or other emergencies (including air invasion).

The Snow and Ice Patrol is a highly organized intelligence unit, made up largely of the state maintenance force and integrated with all phases of road upkeep. The key to its effectiveness is the outpost. At each post is a laborer-in-charge, who alone or with a crew can travel quickly to sections of road needing snow removal, sanding, salt application, emergency repair or other attention. But an equally important function of the

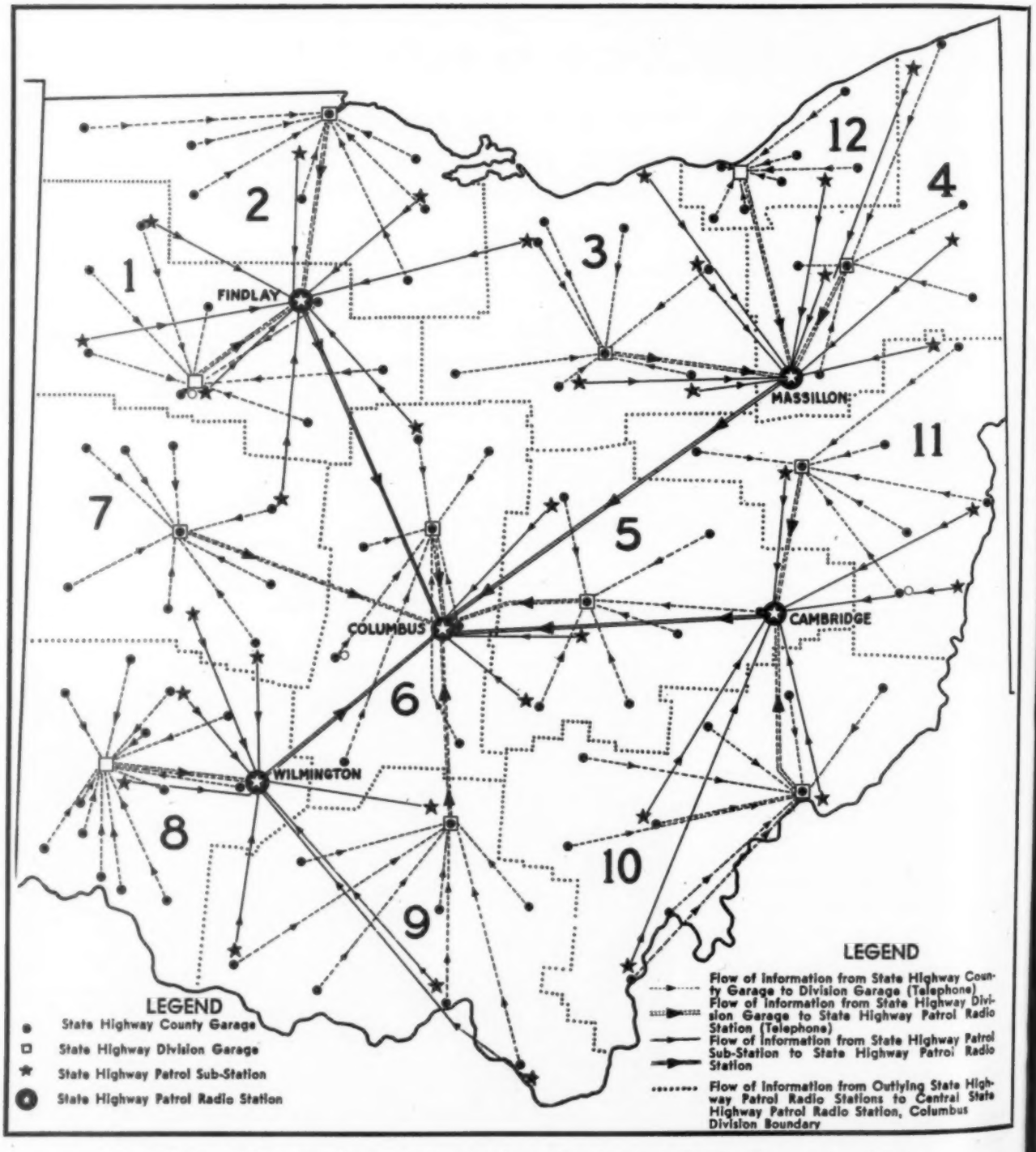


Fig. 1. Showing Ohio's state-wide Snow and Ice Patrol network and the path of information on road conditions.

outpost is that of reporting on weather and road conditions. Three times daily starting at 4 a. m. reports from outposts and county garages are phoned to division garages, and in turn to the nearest of five state highway patrol short-wave radio stations. From here, reports are radioed to state highway headquarters via a central patrol radio station at Columbus. The information thus gathered is then flashed to newspapers, commercial shippers, bus lines, auto clubs and others vitally concerned with road conditions. The chief engineer of maintenance at Columbus and his assistants thus have at all times a current picture of winter road conditions over the state. With this aid they can intelligently direct emergency work and can often expedite snow clearance or other tasks by transferring equipment to the theatre of trouble.

Tested in Recent Flood

The Ohio river flood of last December, which swept out numerous bridges and caused widespread damage, served to spotlight the value of the Snow and Ice Patrol organization. Not a casualty occurred along the entire Ohio river line, thanks to fast work by this service. When the flood rose in the upper valley near Pittsburgh, the movement of its crest and river stages down the valley were reported to a central room in Columbus, and towns downstream warned of the probable height of the crest and time of its arrival. Arrangements were made by phone to move hundreds of families to safety. Road repair and re-building equipment were rushed from central counties to counties adjacent to the river, to be in readiness if needed. Two engineers from the Central Office, Maintenance Bureau, at Columbus, did nothing but travel from town to town down the valley, warning citizens and inspecting the road situation in event of flood blockade. In cooperation with county forces a short higher-level road was constructed to be in readiness to get needed supplies into Gallipolis, Ohio.

The existence of the Snow and Ice Patrol has also fit in well with disaster organization methods recently developed in cooperation with the U. S. Army. One-day "Disaster Organization Schools" were conducted in each of the 12 division offices this spring. Movies, slides and talks were given before the administrative and engineering personnel on such subjects as organization; reporting; communications; emergency road and bridge repairs; directing and controlling traffic in emergencies; route marking and detours; demolition and clearance; evacuations of people and property; de-contamination; blackout procedure; fire defense.

E. R. McCullough, Ohio Highway Division Engineer at New Philadelphia, talking over foreman school details with Chief Maintenance Engineer H. D. Metcalf.

Ohio's One-Day "Blitz" Schools for Maintenance Foremen

A series of unique one-day Maintenance and Repair Conferences featured the start-off of state highway maintenance work during March. In other years schools lasting two days have been conducted in the various division areas, attended by superintendents, engineers and other supervisory personnel. This year, due to the high turnover and consequent large number of green men out on the roads, the school was conducted primarily for the *laborers-in-charge*, or working foremen. Special meetings were also held for mechanics and other men having to do with the keeping up of equipment and equipment records.

Following are the principal points of departure from former conferences, all being designed to liven up the interest and gear the school to the practical men attending.

1. The meetings were strictly one-day affairs. The program was crowded into one long day, from 9 a. m. to 6:45 p. m. "You're like a rag when it's over," said one conference leader. But the men were game and stuck it out without a minute's lag in interest.

2. "Speeches" were banned. Even the opening words by the Division Engineer and the Chief Engineer of the Bureau of Maintenance were held to a few thumb-in-galluses remarks, explaining the seriousness of the maintenance job confronting the state this year.

3. Movies and other picture methods were used more extensively than ever. During the morning session, in which 60 to 80 men sat in a single meeting, short movies were run off showing step-by-step methods of bituminous patching, examples of bridge maintenance problems and what to do about them, and similar topics. A safety movie was also shown. And blackboard and chalk were the principal ingredients of a talk on fundamentals of bituminous materials and their uses.

These visual methods were used to pave the way for more detailed seminar discussions in the afternoon.

Small Seminar Meetings

4. "Quiz kid" methods were used to stimulate discussion. In each of five small rooms a succession of conference leaders sat down on the edge of a table and talked things over informally with the men. This was the real part of the conference, where the men got down to business on such topics as surface maintenance, patching, roadside upkeep, bridge and culvert repair, how to fill out reports, proper use of lumber, what to do in emergencies, etc., etc.

As a further means of keeping these groups warmed up, eight conference leaders went from room to room, giving a half hour to each group. The leader carefully avoided the temptation to do all the telling, but rather tried to draw out questions, perhaps by saying, "Joe, when do you use a paint patch?" Then, if Joe stumbled a bit, he turned and said, "Bill, you've had a lot of experience, what's your answer?" And so on.

Many of the sound practices in the use of bituminous materials have originated with men out on the roads, who have learned from experience *how* to do a given job, or *when* to use, say, an MC-2 asphalt. These meetings were aimed at helping them see the *why*, and so learn to "*think* with the material."

"Why you get good results or bad results" was the theme of the first afternoon seminar session, which was on bituminous patching.

5. Subject matter was kept simple, and confined to every-day problems. We are fortunate in having our headquarters maintenance bureau staff at Columbus, men who are not only specialists but who have the knack of stripping away the "engineering jargon" as one foreman calls it, and "saying what you mean" with simple words and diagrams. In all, fourteen headquarters men went from division to division this spring to put on the conferences.

In addition to the main meetings, a special group meeting was held in a

Ohio Highway Department Has 1028 In Service. At right is Ohio highway director H. G. Sours, showing former state division engineer (now Captain, Corps of Engineer) N. H. Truax, his name plate on the department's big Honor Roll board in the Columbus office. At left is Mr. Truax's successor, R. E. Teegarden.

separate room, on gas and tire conservation and control of vehicle loads. This was attended by the state's county mechanics and clerks, and by division garage superintendents, mechanics and equipment inspectors. The state's county road superintendents also met separately, to discuss equipment conservation.

In conclusion, this form of one-day meeting has been chalked up as a definite success. This in turn is due to thorough planning of all details in advance, clear down to the kind and size and location of meeting places. Each man had his subject so thoroughly planned and carefully timed that every conference session began and ended right on the bell.

The schools were planned and carried out under the author's immediate direction, with the advice and cooperation of our highway director. We were also very fortunate in having the assistance of John Goshorn of the state highway testing laboratory, and Dallas Dupre, Jr., highway landscape architect. Much, too, depended on the able work of my bureau assistants.

H. G. Sours is director of the Ohio state department of highways, G. R. Logue, assistant director and chief engineer.

Typical Examples of Down-to-Earth Discussions in Ohio Foremen Conference Meetings

Ques. Where do you use a bituminous "paint patch"?

Ans. Where a road is checked or "open." For depressions or breaks too thin to patch satisfactorily with a pre-mixed patch or for a bituminous pavement showing surface ravelling.

Ques. What good is a paint patch when the road is checked or "open"?

Ans. It keeps water from going down through the pavement. If done at the wrong time it may do more harm than good by sealing water in or under the pavement.

Ques. Should you do any paint patching at all in winter?

Ans. Yes, in the worse or more critical open or checked conditions. In this case it often pays by preventing holes from developing and is an inexpensive method even if some failures do occur in the spring.

Ques. How thin can you make a good cold patch?

Ans. A good rule is not less than the equivalent of two stone thick. It is noticeable that a feather edged patch such as is used to correct a depression often ravels away at the edges until it reaches a point the equivalent of two stone thick, where the ravelling generally stops.

Ques. How about a deep patch?

Ans. Don't make over the equivalent of four stone thick for a one layer of pre-mix. If deeper, use pre-mix made from coarser aggregate or build up in multiple layers or use a penetration or macadam patch. Too thick a patch made from pre-mix composed of too fine an aggregate will cup if small, or shove if large.

Ques. How do you mix pre-mix bituminous patch material?

Ans. Hand shovel, mixer, or blade grader, or purchase from a commercial plant in some areas. The blade grader method is good for large quantities. Dry aggregate is tailgated on the pavement "shot" with liquid bituminous material and mixed with a blade grader. It is by far the cheapest way for larger quantities. Disadvantage: It's a fair weather method. You can't do it in the rain. You can't do it if the weather is too cold either. If you stock pile the material use *big* piles. A lesser percentage cures out in the pile that way. A good idea is to cover the pile with about a one-inch layer of sand or stock in old calcium chloride bags, then in cold weather bring in the sacked material and store in a warm place a day or two before you want to use it.

Points Brought Out in Slide Talk on "Bridge Maintenance"

1. Where a winding current is undercutting a wingwall, cut a new creek channel near midstreatm.

2. Locate the guard rails on approaches to converge *gradually* to end-posts of narrow bridges. Many fatal crashes and wrecked bridges are due to improperly protected end-posts. Rails should continue over approaches and across through-type truss spans without a break.

3. Remove accumulations of dirt and chats from bridge deck. Gutters along deck curb are often filled, and drain holes clogged, which causes improper drainage and deterioration of deck. It rots floor planks.

4. Keep bridge seats clean. Check every so often, especially after heavy rainstorms.

5. Report structural troubles on steel spans at once. Especially check condition of bridge seats and expan-

sion details, and look for movement of abutments which may set up abnormal stresses or prevent expansion. Always get down under the bridge while inspecting. That's where rust and trouble lurk.

6. Watch deck and abutment drainage. Road chemicals are hard on steel work, and roadway should always drain as called for on plans.

7. The outside beams of concrete girder bridges get the worst exposure, and hence deteriorate first. Watch bridge faces and report places needing patching.

8. Don't wait to clear away driftwood around piers.

9. When humps and bumps develop in the pavement at bridge ends, repair them promptly. Requisition help if needed.

Other Practical Maintenance Hints

Surface Treatment

Watch your distributor. Follow up surface treatment crews and take care of spots where the distributor wobbled, spray nozzle stopped, etc.

* * *

Deciding when and how long to close a road during treatment calls for careful judgment. If cars going through pick up gobs of chips, close the road for a while longer, even where there's considerable inconvenience.

* * *

November patches are good as an emergency or to tide you over the winter, but they're likely to bleed the following summer. Poor penetration when the pavement is cold.

* * *

Drag treatment should be done in the fall only as an emergency. As with any other time, put down your chips right behind the distributor. Stop the distributor a dozen times, if necessary, to keep chips coming.

* * *

Traffic Bound Road

Some of you are going to have more miles of traffic-bound surface this year. We'll have to let some roads go back. The 30-ton loads from the coal strippers and the big steel trucks in eastern Ohio are a problem in this connection.

Should a traffic-bound road have more crown? Yes, slightly. About 4½ or 5 inches for 2 lanes.

* * *

Use of Lumber

Ques. What is biggest lumber problem right now in your bridge repair?

Ans. To get the right size and good quality. Much new lumber is green. Don't hesitate to use salvage lumber. Much of it can be used for concrete forms or form bracing. Save and re-use your No. 50 spike nails and square cut 60's.

Ques. How about seasoning?

Ans. Let new lumber season as long as possible. Stock up now for later. Seasoning will double or triple its life. Cure a whole year if you can. It takes that long for perfect lumber.

Ques. What would you do with a shipment of green lumber?

Ans. Put it on stick immediately. Use plastering lathes. Too heavy a stick means too much air, hence warping and cracking. Place sticks exactly over one another, right on up to the top of the piles. Use end supports, too. It *conserves* lumber. And when you want some boards, disturb the pile as little as you can, and carefully put all remaining boards back.

Ques. Are we justified in butt-treating posts?

Ans. Yes, it pays. But watch creosote. It will burn or poison 90% of the men on contact with a sweaty arm.

Chatterbumps? Keep after 'em. They're formed through loss of fines in the loose surface. Use chemicals past farm houses. Graders and heavy drags in spring. Get in after rains. Don't drag too fast, or with blade always in the same direction. One patrolman found some help on "washboards" by keeping a windrow of aggregate mixed with a little dirt. Every so often he bladed a very light mulch inward. Another used shale and gravel in the same way. It replenished the binder.

Bridge Approaches

How do you keep from "building up" a hump in the roadway at bridge ends? Grade away from the bridge at all times. Back your grader over these points, or turn machine around.

Roadway Maintenance

A box drag is a good drag. We'll see more of them before the war's over.

* * *

Roll sod on shoulders. Saves a lot of maintenance.

* * *

(Unanswered question): Why is it that a contractor on a new grade has to stretch a line and pat shoulders and slopes with a rake to get them accurate enough for the engineers, yet once the road is built, no one expects the maintenance men to restore shoulders to anywhere near this accuracy after rains, etc.?

Eastman Advises Cities on Traffic

Detailed information on methods of simplifying and speeding traffic control systems was sent to the mayors of all cities of 10,000 or more population by Joseph B. Eastman, director of the Office of Defense Transportation.

The purpose is to fit traffic control to war. Mr. Eastman said he would ask the mayors to report in three months what steps they had taken.

A sixteen-page pamphlet was issued as a guide. It asked cities to eliminate unnecessary stop-go signals, change stop-go signals to flashing lights in hours of light traffic, shorten stop-go signal cycles as much as possible, adjust length of green "go" periods to fit changed traffic, change cycle length or division of the cycle during hours when traffic variations justify it, coordinate near-by stop-go signals, save traffic police manpower where stop-go signals would do the job, keep stop-go periods at police-controlled intersections as short as possible, remove stop signs no longer justified, revise traffic and parking regulations to expedite war traffic, set up primary transportation routes and use traffic control equipment on hand rather than buy new.

The operation of traffic signals, it was said, should generally be discontinued unless total traffic entering an intersection from all directions averaged at least 1,000 vehicles an hour for eight hours a day, of which at least 250 entered from the minor street or pedestrians crossing the major street averaged at least 300 an hour for at least six hours a day and vehicles entering the intersection from the major street average at least 750 an hour for the same six hours.

Mr. Eastman noted that an increasing number of complaints had been received recently regarding the time wasted by war workers in public vehicles and automobiles held up by traffic lights. He said he would ask the State Highway Traffic Advisory Committee to make the necessary adjustments in wartime traffic control in their States through the departments having jurisdiction.

Pre-Framed Timber Bridges in New Hampshire

By H. E. LANGLEY
Bridge Engineer, New Hampshire
State Highway Department

DURING the fall of 1941 it became difficult to obtain the usual structural materials required for the maintenance and construction of highway bridges in New Hampshire. A survey of the situation indicated that structural steel shapes and steel reinforcing bars would be unobtainable for use on most of the bridges which would normally be constructed in 1942. This normal bridge construction program is due, in general, to two basic reasons. The first is the obsolescence of existing bridges due to their inability to carry modern traffic with reasonable safety and the second is the result of change in location or design of portions of existing highways and to the elimination of railroad grade crossings. Those in the first group usually have been in service many years and are substandard in strength as well as in roadway clearances. Frequently bridges in this class have reached such a condition that it is no longer feasible to properly maintain them. The second group includes structures which are usually substandard because of roadway clearances, occasionally because of insufficient strength, and frequently because of their location which prevents securing a location and alignment of the adjacent highway satisfactory for modern traffic. To these two main groups should be added another relatively small group which cannot be anticipated and which includes structures that are damaged or destroyed by flood or accident.

In New Hampshire there are approximately 900 bridges on the state highway system. Of this number about 150 have been rated as substandard for civilian traffic and a somewhat larger number for military traffic. A large portion of these structures have short spans which vary in length from 20 ft. to 70 ft. Past experience indicated that some of these structures would require replacement if continuous service was to be maintained over the entire state system. From a review of the non-critical materials satisfactory for bridge construction it was evident that, in general, there would be three available. These were stone masonry, mass concrete masonry and timber. With the exception of cement and the hardware required in timber construction, all other materials were produced within the state.

Design Feature

Because of the conditions just outlined, the New Hampshire State highway department during the winter of 1941-1942 developed plans for two stone arch bridges and several wooden superstructures for spans varying in length from 20 ft. to 65 ft. For timber spans under 30 ft. simple stringer types were used, and for spans 30 ft. and over, deck or through pony trusses. All these designs provided for a 24-ft. clear roadway and a live load capacity of H-15. As these timber superstructures could be fabricated and stored at some central point until needed, emergency replacements were assured with little curtailment of highway traffic. The principal items of hardware needed in considerable amounts were timber connector rings, bolts, nuts, washers, and spikes. The rings were purchased with little difficulty. Some of the bolts and all of the washers were made at the State Highway maintenance shops. The balance of the bolts were secured from a salvaged stock of used bolts. Only a portion of the required spikes could be purchased, so that a program of salvaging and straightening used spikes was inaugurated. This proved quite successful so that sufficient spikes were made available.

Fig. 1—Fabrication of built-up floor beam

Fabrication Method

Fabrication and storage of these superstructures was made at the Department's storage yard at Concord. After the members of a superstructure were fabricated it was erected on blocking to assure proper connections and fit. All bolts, nuts, washers, and connector rings were placed and, prior to dismantling for storage or shipment, all members were matched marked. The use of a properly equipped central fabricating plant promoted efficiency and economy. It is obvious that transportation of tools and equipment to each bridge site, together with the setting up of the necessary plant, entails considerable time and expense. Furthermore, electrical power-driven tools are used in the fabrication and frequently such power is not available at the bridge site.

All the designs were based on the use of a good grade of native hemlock timber except for the stringers of the shorter spans. These members were secured by re-sawing heavy

Fig. 2—65-ft. trusses erected prior to floor erection

Fig. 3—Preliminary erection of trusses at fabricating plant. Fig. 4—Typical truss details

southern pine timbers salvaged from a mill building which was dismantled during the fall of 1941. As no timber of the necessary strength and dimensions was available for the floor beams of the through truss superstructures, it was necessary to use built-up members, (Fig. 1). In order to provide simple connections the working lines of the web members of the through trusses do not intersect at the working lines of the top and bottom chords, (Fig. 4). This arrangement has the disadvantage of increasing the secondary stresses in the chords. The end panels of the upper chord showed considerable deflection under this action in the first 65-ft. truss when erected at the yard. Structural steel plates of sufficient length and width to engage all the bolts in the hip connections were fabricated from salvaged stock. After the trusses were blocked up at each panel point so that there was no truss action, a plate was placed on the outside of each hip connection. This device proved satisfactory and practically eliminated the deflection in the end panels of the upper chords. To simplify fabrication in the first truss spans, camber was applied to the floor system and not to the trusses. From the experience gained in the fabrication and erection of several of these spans, it is believed that no difficulty will be encountered in cambering the trusses and built-up floor beams. As the residual camber of a timber truss after it is swung will gradually decrease over a period of time, a camber of approximately 1/120 of the span seems desirable. This camber will be reduced by about one-third when the span is swung. It is anticipated the remaining camber will be further reduced, due to the shrinkage of the timber and the gradual take-up of the connections.

As native hemlock retains little

Fig. 5—View of 65-ft. trusses after erection in field

Fig. 6—Erection of built-up floor beams in field

creosote when plant treated, all the timber was given two heavy brush applications prior to storage or shipment. This treatment, together with a tar coating applied to the ends of all members, aided materially in reducing checking of the timber. The hemlock timber was received directly from the mills and was very green. In spite of this unsatisfactory condition only a few members had to be replaced because of excessive checking.

Erection Method

The make-up of the several members of the through trusses is shown in Figs. 2 to 7. So far the timber

superstructures have replaced ones of light steel construction. By using the existing decks the timber trusses have been erected without the use of falsework. The usual practice has been to assemble the trusses in two sections and place them outside the existing trusses by means of a small truck crane shown in Fig. 6. One section is placed and supported by the existing deck until the other is

Fig. 7—General view of 65-ft. truss deck

placed and the two connected. The truss is then braced so that it is not disturbed when the old deck is removed. After the removal of the old deck the trusses are moved if necessary to their proper positions and the remainder of the superstructure is erected.

It is proposed to give these structures a brush coat of creosote and to tighten all bolts once each season. It should be realized that their useful life is uncertain and cannot be compared with that of the old covered timber bridges in the State, which, in many cases, have given satisfactory service for over fifty to one hundred years.

Costs

The relatively low costs of these bridge superstructures have been gratifying. The 65-ft. superstructures were fabricated for approximately $35 per linear foot of span. This amount covers all timber, hardware, equipment rental, and labor. One of these superstructures was hauled approximately 150 miles by truck and erected at a cost of less than $10 per linear foot of span. The cost of material and fabrication of a 20-ft. stringer span was $25 per linear foot of span. A 75-mile haul, plus erection, cost about $5 per linear foot of span. These costs are about 40 per cent of those of similar spans constructed of more permanent materials.

Prior to 1941 the Department had constructed, under contract, one covered through timber truss span and two temporary suspension foot bridges employing timber stiffening trusses. Timber connector rings were used for the connections on all of these bridges. The covered timber span was constructed of western fir and has a span of 84 ft. It was designed for an H-15 live load and should give many years of satisfactory service. Its cost per linear foot of span was in excess of $120. The stiffening trusses, floors, and cable towers for the foot bridges were of western fir. The main spans were 425 ft. and approximately 200 ft. As their construction was due to the loss of other bridges by flood, their fabrication and erection was carried on as rapidly as possible. Much of both operations, therefore, occurred simultaneously so that detailed costs are not available.

Low Cost Access Roads to Secure Raw Materials

To meet the need of America's war industries for raw materials, more than 2,850 miles of access roads to mines, quarries, and forests have been scheduled for construction.

By March 1 of this year roads of this type had been approved for construction to cost about $9,000,000, according to a recent announcement by Commissioner Thomas H. MacDonald of the Public Roads Administration. A hundred miles of such roads were completed in 1942 at a cost of $346,000. These access roads to sources of raw materials are exclusive of the access roads to military establishments and industrial plants.

Most of the roads to mines, quarries and forests are shaped with a bulldozer and surfaced with gravel at relatively small expense.

Deposits of 28 different minerals, metals, and rare elements are tapped by these roads at about 225 locations in 22 states and Alaska. The access road in Alaska, 9½ miles long and costing $93,500, gives access to a chrome mine.

Other access roads serve mines of chrome, and antimony, asbestos, bauxite, beryl, calcite, coal, cobalt, copper, cupric scheelite, flourspar, garnet abrasive, graphite, iron, lead, manganese, magnesite, mercury, mica, nickel, rutile, stibnite, spodumene, talc, tungsten, vanadium, vermiculite, and zinc. Connections are also made with timberlands.

Under the Defense Highway Act of 1941 Public Roads Administration is authorized to administer Federal funds for construction of access roads certified as to their war essentiality by the War or Navy Departments or War Production Board. Proposed projects are generally reviewed by the Bureau of Mines, the Geological Survey and the Mines and Mineral Section of the War Production Board to determine that there is a deposit of raw materials worth developing.

State highway departments are in charge of the actual construction of about 30 of the projects for access roads to raw materials; U. S. Forest Service about 90; U. S. Office of Indian Affairs 6; U. S. Grazing Service 55; and the Public Roads Administration about 15. Individual projects range in length from less than one mile to as much as 170 miles.

By states, the mileage and construction costs of the access roads to sources of raw materials are as follows:

Alabama six miles, $130,000. Arizona 144 miles, $255,600. Arkansas seven miles, $224,500. California 550 miles, $1,446,895. Colorado 399 miles, $882,239. Idaho 371 miles, $1,426,830. Kentucky three miles, $22,000.

Maine 5 miles, $16,700. Minnesota 164 miles, $39,300. Montana 187 miles, $980,475. Nevada 260 miles, $1,095,164. New Mexico 134 miles, $550,060. New York one mile, $39,300. North Carolina, 11 miles, $29,000. Oregon 223 miles, $790,275.

Tennessee 22 miles, $67,500. Texas 15 miles, $55,000. Utah 493 miles, $563,050. Vermont 12 miles, $94,699. Washington 88 miles, $547,059. West Virginia eight miles, $17,500. Wyoming 27 miles, $43,937.

▼

Farm to Market Movements by Trucks

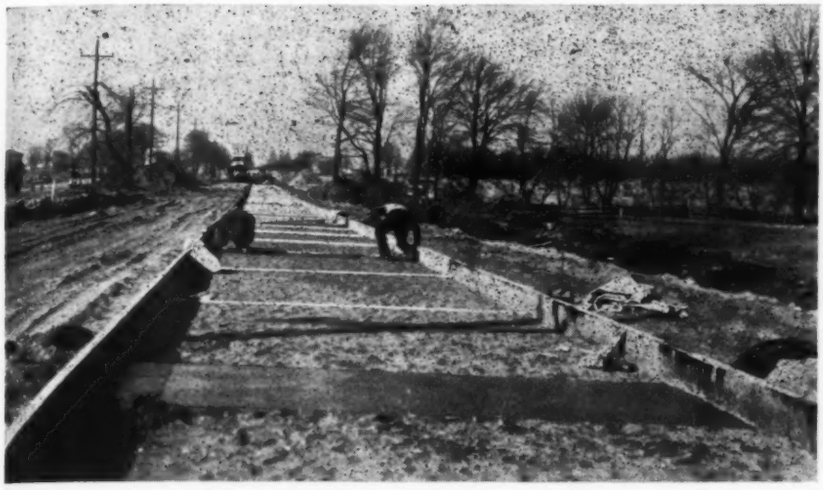
The highway movement of potatoes from Maine during the 1941-42 season totaled 1,664,094 sacks or the equivalent of 4,625 rail carlots.

In 1935 Chicago received 1,677,000 cases of eggs by rail and 2,117,000 cases of eggs by truck. In 1940 Chicago truck receipts of eggs had grown to 3,297,000 cases and rail receipts were 1,965,000 cases.

Livestock receipts at 17 large stock yards in 1921 were 94 per cent by rail and 6 per cent by highway. By 1941 these stock yards were receiving 64 per cent of their live stock by highway and 36 per cent by rail.

Highway delivery of butter to Boston grew from 1,280,000 pounds in 1935 to 5,695,000 pounds in 1940.

Load-transfer Sills Under Dowel-less Joints



Showing concrete supporting slabs for expansion joint (in foreground), and wood strips for dummy contraction joints, as provided on Sections 1 and 2 of Fort Dix Access Road. Divided 22-22 ft. roadway. Franklin Contracting Co.

TWO concrete access road projects under construction in New Jersey afford interesting examples of pavements designed to conserve critical material to the utmost. The principal design feature is the use of concrete load-transfer slabs under the expansion joints to offset the lack of dowels.

One of these is the Picatinny Arsenal Access Road, near Dover, N. J. The standard New Jersey pre-war design was a reinforced concrete pavement of uniform 9-in. or 10-in. thickness, with ¾-in. expansion joints spaced 56 ft. 4 in. apart. Load transfer at the pre-war expansion joints was provided for by 2-in. steel channels, instead of the ¾-in. round dowels commonly used, and the entire joint assembly was supported by the road forms by means of special attachments thereto designed by the New Jersey State Highway Department and in use since 1934.

Picatinny Road Design

Since the war precluded the use of steel, the joint spacing was shortened to 25 ft. and the 10-in. thickness was called for. Traffic requirements were thought to demand not only a good subbase but also something to take the place of the heavy load transfer device formerly used, in order to distribute and reduce the intensity of the high load pressures on the subgrade ordinarily incurred at slab ends.

As a result of observations made on an experimental road tested to destruction in 1932, a concrete sill was specified under the joint. This extends 2½ ft. on either side of the joint, and within 9 in. of the sides of the slabs. Sills are 4 in. thick and raised 2 in. above the subgrade line. Although the pavement over the sill is 2 in. thinner, experience indicated that this is sufficient, according to highway department officials. The reason for raising the sill above subgrade is to help prevent an accumulation of infiltrated dirt between the sill and the pavement, either from the shoulder or the pavement surface. The subbase is 12 in. of selected material which is 10 in. under the sill.

Expansion joints are spaced at 25 ft. intervals. The joint itself is a 2-in. "plank" (1⅝ in. minimum thickness), shaped to fit the subgrade and the sill and left ¼ in. below the pavement level. Spruce planks are being used although Douglas Fir is allowed. Because of the short slab lengths employed and the considerable thickness of the joint lumber, plus the well-known tendency of the wood to swell, it is believed that these joints will be fairly free from an excess infiltration of dirt and water. It is expected, however, that progressive compression of the wood, accompanied by the infiltration of foreign materials, will occur to some extent for some time; but that, ultimately, this process will cease and the joint space will become more or less completely filled with wood which has reached the limit of its progressive compression although retaining an appreciable part of its capacity to swell, plus impervious, tightly packed, fine silt or sand.

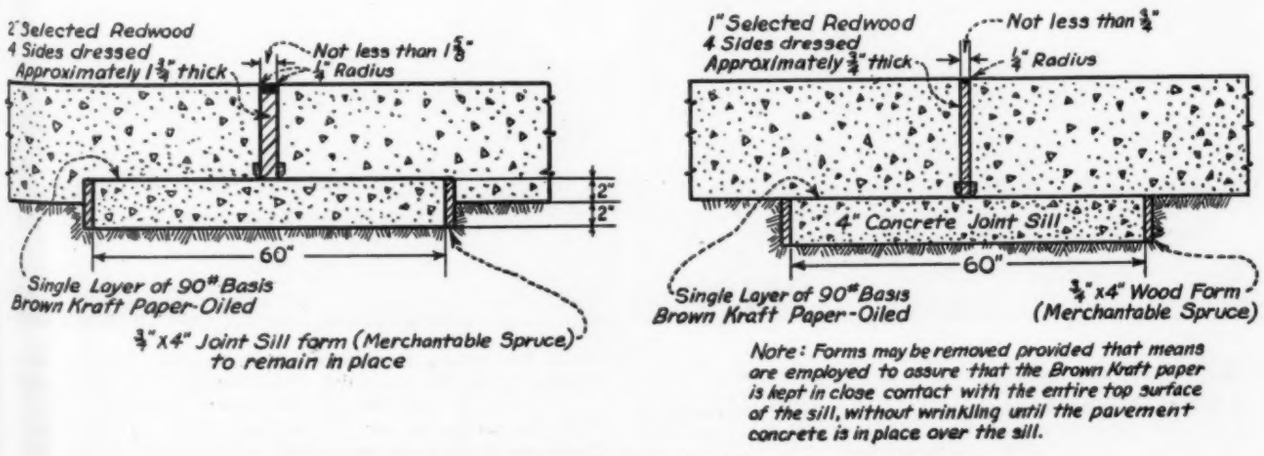

2" Selected Redwood
4 Sides dressed
Approximately 1¾" thick
Not less than 1⅝"
½" Radius
2"
2"
60"
Single Layer of 90# Basis
Brown Kraft Paper-Oiled
¾"x4" Joint Sill form (Merchantable Spruce)
to remain in place
1" Selected Redwood
4 Sides dressed
Approximately ¾" thick
Not less than ¾"
½" Radius
4" Concrete Joint Sill
60"
Single Layer of 90# Basis
Brown Kraft Paper-Oiled
¾"x4" Wood Form
(Merchantable Spruce)
Note: Forms may be removed provided that means are employed to assure that the Brown Kraft paper is kept in close contact with the entire top surface of the sill, without wrinkling until the pavement concrete is in place over the sill.

Fig. 1—Details of the two variations in load transfer slab design used in New Jersey

Fort Dix Road Design

The other road is the Fort Dix Access Road, which was divided into three sections one of which was on the State Highway and the Federal Aid Systems. Here the design was changed, and three modifications were selected for the three contract sections. The expansion joint spacing is 105 ft. on all these jobs, plus dummy contraction joints spaced 15 ft. apart. Redwood was used for all expansion joints having a minimum of ¾-in. thickness on one job and 1⅝-in. on the other two. The joints were recently examined during cold weather and it was noted that the wood does not, at present at least, completely fill the joint space when the slabs contract, there being in some instances as much as ¼ in. of open space between the wood and the sides of the joint space during the colder weather. This, of course, was anticipated, and it points to the necessity of providing a material which will swell or increase in thickness as the joint space opens, especially in conjunction with long slabs. A variation was the sill design. On one section, the sill was recessed and raised as on the Picatinny Road; and, on the other two, the top of the sill was made flush with the subgrade and extended the full width of the slab.

Support Slabs Considered Experimental

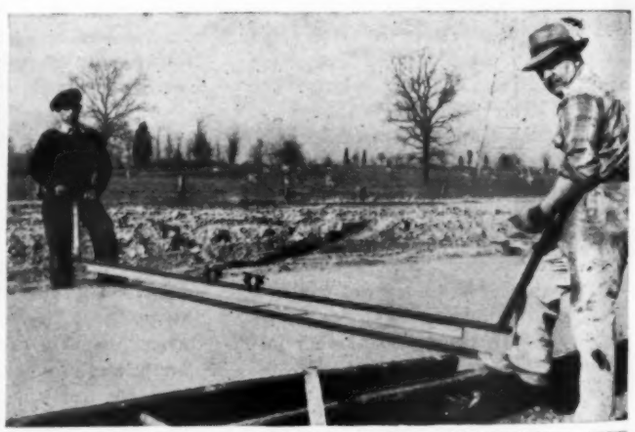
Frankly, according to H. W. Giffin, New Jersey Engineer of Surveys and Plans, all of these designs can be regarded as experimental, as no one can foretell what faults may be expected to develop. The state is making some careful measurement during construction to learn the behavior of the various features in the designs. It may be several years before well supported conclusions can be reached. However, it is hoped that some early indications may point toward these conclusions.

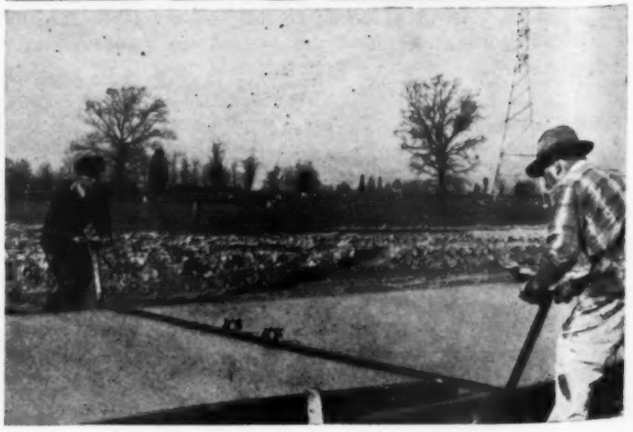
One of the things observed about the dummy contraction joints is that they do not crack simultaneously. Initially, these joints crack at intervals of 45 ft. and 60 ft., and these cracks tend to become quite wide. After the expiration of some time, cracking takes place at some of the intervening contraction joints although these cracks which form later are not nearly so wide as those formed initially. It is hoped that, in due time, all the contraction joints will crack; and that, when warmer weather arrives, expansion will cause an equalization of crack width before infiltration of incompressible material into the wider contraction joints takes place. The efficacy of this design is based upon the assumption that, if none of the contraction joints opens appreciably after cracking, load transfer will be accomplished by aggregate interlock. It is desirable, therefore, that rearrangement should soon take place which will reduce the width of the existing wider contraction cracks.

Incidentally, the state is inserting a few regular channel dowel load transfer joint structures in these jobs for purposes of comparison. Also, it is using self-expanding cork in place of the redwood in a few joints.

The department has been studying the use of pre-compressed wood joints for some time, and is installing a few of these for the purpose of comparison on both of these roads and on other jobs.

From a study of the behavior of all





Above: Installing wood strips for dummy contraction joint

Below: Closer view of joint support slab. Top of slab was covered with oiled paper to prevent bond with pavement. Expansion joint filler is ¾-in. redwood

Above: The upper grooves for dummy contraction joints were made by pressing this tool, consisting of light-section "T" rail with base cut off. Union Building and Construction Corp.

Below: The cutting tool was sunk until head of the "T" rail rested on the side forms, then tool was removed and wedge-shaped wood strip, 2-in. deep, inserted in the slot

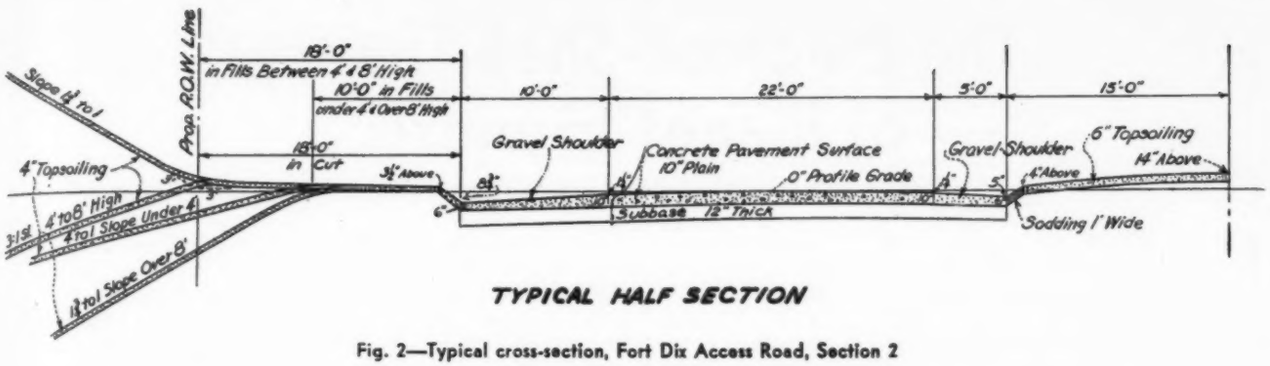
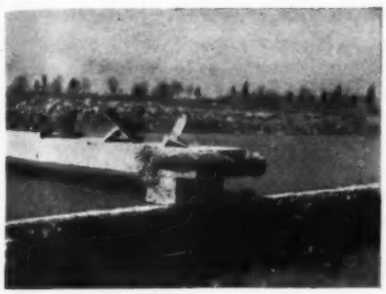


Fig. 2—Typical cross-section, Fort Dix Access Road, Section 2

the variations it expects, in time, to know more about joint design than now; and, whatever the situation may be after the war, much of this information is expected to prove useful in future designs.

"The war has stimulated our thinking and research along these lines and



Edging tool at right used for forming slot at longitudinal center joint between slabs. Tool in center used for forming transverse dummy contraction joint to required depth. Tool at extreme left has short radius of not more than 1/4-in. and is used for edging all joints

I believe something of benefit is sure to result," according to Mr. Giffin.

Construction Notes on Fort Dix Access Road

Of interest is the accompanying table of estimated construction quantities on the Fort Dix Acess Road contracts. These jobs, let last year and held over for completion this spring, are summarized as follows:

1. Section 1 of Fort Dix Access Road comprises 4.88 miles of new location leading from a point within the Fort reservation to Georgetown, N. J. Contract went to J. B. Burns, of Dumont, N. J., for $902,000, including $97,000 for several bridges. This project includes a short stretch of 4-lane divided road within the Fort, the remainder being stage construction consisting of a 22-ft. pavement with 10-ft. gravel shoulders (Fig. 2). An old road, roughly paralleling, is to be used for added traffic capacity. As with all access road sections, the gravel shoulders are designed to serve as part of the traveled way during army maneuvers and in other emergencies.

2. Section 2 of Fort Dix road is a 3.52-mile project, continuing over new location from Georgetown to Mansfield Square. Contractor is Franklin Contracting Co., of Newark, at bid price of $709,000. Contract includes the full cross-section, consisting of two 22-ft. roadways with a 30-ft. dividing strip. (See Fig. 3.)

3. The third contract, known as Section 1 C and 2 A of Route 39, Mansfield Square to Bordentown, consists of 2.2 miles of converting a 2-lane existing road to a 4-lane divided road by reconstruction let to Union Building and Construction Co., of Passaic, N. J., at $695,000, including $135,000 for bridges. Whereas the other jobs are 100 per cent federally financed, this is an F.A. job (25%-75%). The cross-section calls for 22 ft. of concrete, with a 5-ft. inner and 10-ft. outer gravel shoulder.

All three jobs are in coastal plain ground, with plenty of storm drainage and culverts required. Part of the subsoil is of good sandy or gravelly material, but about two-thirds of the project is through green sand marl. The 12-in. bank run gravel subbase under pravement and shoulders was

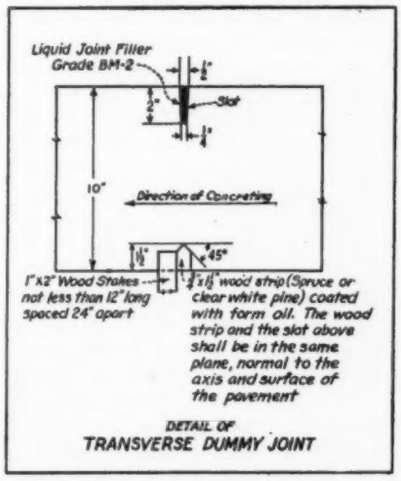

Liquid Joint Filler Grade BM-2
1"
1/2"
Slot
1"
10"
Direction of Concreting
1/2"
45°
1"x2" Wood Stakes not less than 12" long spaced 24" apart
1/2"x1 1/2" wood strip (Spruce or clear white pine) coated with form oil. The wood strip and the slot above shall be in the same plane, normal to the axis and surface of the pavement
DETAIL OF
TRANSVERSE DUMMY JOINT

Fig. 3—Detail of dummy transverse joint construction

successful in eliminating frost heave this past winter on the sections paved before the winter shut-down.

Contracts and plans for the foregoing project were prepared under the supervision of H. W. Giffin, engr. of survey and plans. C. A. Burns, Northern district engineer, was in charge of the Picatinny Arsenal road and H. D. Robbins, Southern district engineer, in charge of the Fort Dix contracts. C. F. Bedwell is acting New Jersey state highway engineer and Spencer Miller, Jr., commissioner.

Unit Bid Costs on Fort Dix Access Road Contracts

Project	Earth Excavation Quan.	Unit Price	Gravel Subbase Quan.	Unit Price	Gravel Shoulders Quan.	Unit Price	10-in. Uniform Conc. Pavement Quan.	Unit Price	Drainage Quan.	Unit Price	Joint Sills Quan.	Unit Price
Fort Dix, Sec. 1	305,000[1] cu. yds.	0.45	47,000 cu. yds.	0.80	51,259 sq. yds.	0.25	77,794 sq. yds.	3.80	17,000 lin. ft. 18"-42" v.t. pipe	varying	3,701 sq. yds.	2.75
Fort Dix, Sec. 2	91,284 cu. yds.	.35	51,133 cu. yds.	0.63	65,591 sq. yds.	0.20	91,645 sq. yds.	3.879	17,000 lin ft. 18"-36" v.t. pipe	varying	4,365 sq. yds.	2.50
Route 39, Sec. 1 C and 2 A	93,000[2] cu. yds.	0.62	33,000 cu. yds.	0.60	34,000 sq. yds.	0.20	64,000 sq. yds.	3.7113	12,000 lin ft. 18"-36" v.t. pipe	varying	2,636 sq. yds.	2.40

[1]Plus 30,000 cu. yds. wet exca. @ 0.46.
[2]Plus 92,000 cu. yds. borrow @ 0.50.

The Electron-Shell Theory of Planet Genesis

By HALBERT P. GILLETTE

IN 1596 Kepler published the first attempt to show that the distances of the planets from the sun are systematically arranged. Only six planets were then known, whereas, including Ceres, which is the largest of the small planets called asteroids, ten planets are now known. In 1772 Bode published the second attempt to show systematic arrangement of the orbits of the six planets. Bode's law "appears to have been discovered by Titius of Wittenberg some years earlier." It can be stated thus: If the mean distance of the earth from the sun be called 10 then that of Mercury is about 4, and that of each successive planet is 4 plus a term of a geometrical progression series whose ratio is 2 and whose first term is 3. This law makes the approximate relative distances of planets: 4, 6, 10, 16, 28, 52, 100, 196 and 388. When Bode's law was published, there were no known planets at distances of about 28, 196 and 388 which correspond closely with those of Ceres, Uranus and Pluto. Nearly midway between 196 and 388 is the planet Neptune, so that although Neptune does not fit Bode's law it evidently belongs to a system of planet distances.

In my search for some law that would correlate weather cycles, I found that there is a series of cycles each of which is just three times the length of the next shorter one, as stated in my December, 1942, article. One of these cycles is exactly 67 times the period that the earth takes to go round the sun, or 67 years. There are much shorter, as well as much longer, weather cycles in this triple-progression series, one of which is 69/9 or 7.4444 years; and 4 times its length is 29.7777 years, which differs only about 1 per cent from Saturn's orbital period of 29.4577 years. So I infer that originally Saturn's orbital period was exactly harmonic with weather cycles of the triple-progression series. Two times Saturn's orbital period differs less than ½ per cent from 5 times Jupiter's orbital period. The orbital periods of Venus and Mars are very nearly as 1:3. Many other close approximations to commensurability of orbital periods could be pointed out; but the present article is concerned with relations between planet distances.

In 1937 Major A. W. Stevens photographed the sun from an airplane during a solar eclipse, and discovered that the sun's pearly corona, which is not ordinarily visible because of the glare, is a perfect sphere having just twice the diameter of the sun's incandescent disc. This tended to confirm a theory that I had published in 1933 and 1935 that the sun and all planets and comets are encased in a series of rotating electron-shells that are loaded with gases. I had inferred that the low density of Jupiter, Saturn, Uranus and Neptune is due to their visible discs being gas-laden electron-shells whose diameters are either 1.5 or 2 times those of their molten or solid cores. For example, if Saturn's visible shell has double the diameter of a molten core, the density of that core must be nearly 8 times Saturn's over-all density of 0.71, or 5.68. The Earth's density is 5.52. In like manner if the visible shells of Jupiter, Uranus and Neptune have diameters 1.5 times those of their cores, the density of each core turns out to be about that of the Earth! This discovery led me to infer that the sun's incandescent shell also has a diameter 1.5 times that of a molten core, for then the density of the latter would be about the cube of 1.5 times 1.41 (the overall density of the sun), or about 4.76. The weight of the solar gases overlying that molten core would prevent its becoming gaseous.

Starting with the diameter of such a solar core as a basic unit, and applying the double-progression law, there should be a solar electron-shell of 59.33 million kilometers radius. This is only 2.5 per cent more than Mercury's mean distance from the sun!

The orbits of two of the 10 planets are quite "eccentric," that is quite elongated ellipses. Thus Mercury when at aphelion (farthest from the sun) is about 6/5 times its mean distance; and Pluto's corresponding ratio is 5/4. When at perihelion (nearest the sun) Pluto is very close to Neptune's orbit. This led me to infer that Pluto owed its growth largely to matter in the electron-shell that promoted Neptune's growth, as well as to matter in a shell 2.5 times as far out from the sun. This, in turn, led to a study of the eccentricities of other orbits, notably those of comets, which disclosed abundant evidence of approximately commensurable relations between perihelion and aphelion distances!

It has long been known that many comets when at aphelion are close to Jupiter's orbit; but this has been attributed to their "capture" by Jupiter's gravitative attraction. Yet why that "capture" gave them aphelions near Jupiter's orbit has never been shown. No one has even suggested that Pluto was "captured" by Neptune because its perihelion is near Neptune's orbit. The "capture theory" certainly provides no explanation of nearly commensurable perihelion and aphelion distances, whereas genesis in electron-shells loaded with molecules makes clear the cause. As an example of perihelion-aphelion relationship, I will cite Winnecke's and Encke's comets. The former's aphelion distance is 5.56 "astronomical units," and its perihelion distance is 0.92, a ratio of almost exactly 6 to 1. The corresponding ratio for Encke's comet is almost exactly 12 to 1. Of the 33 best known comets that have returned often, two have perihelia almost exactly in the Earth's orbit; and two have perihelia almost twice as far out; one has its perihelion almost exactly in Venus' orbit; and two very nearly twice as far out as that from the sun.

Jupiter has 11 moons and Saturn has 9. Laws similar to Bode's were long ago found to fit the mean distances of most of these satellites from their parents.

There are many remarkably close approximations to commensurability of diameters of planets. The visible shells of Uranus and Neptune have nearly the same diameter. Venus and Earth have nearly the same diameter, and it is almost exactly ¼ that of Uranus and Neptune. Mars' diameter is about ½ that of Earth, and double that of our Moon. Jupiter's diameter is almost exactly 1/10 that of the sun. Such remarkable relationships are too close and too numerous to be accidental; but they seem to have been regarded as lacking in significance. It has been a common mistake to dismiss as accidental relationships that could not be explained by existing theories, and this has often been done where a mathematical calculation would have shown it to be very improbable that the relationship was accidental.

Eons have passed since the genesis of the solar system. Electronic forces as well as friction have been operating throughout those eons, often with a tendency to alter original orbital and rotary periods. Our Moon, for example, has ceased to rotate axially with respect to the Earth. Because of these long continued effects, no law of orbital period or distance correlations should be expected to be precise. In fact it is remarkable that such close approximations to exact commensurability often exist. Consider, for example, the lunar phase cycle that Meton discovered nearly 24 centuries ago. That cycle is only about 2 hours longer than 19 years, during which the moon returns to the same phase on the same day of the month. There is an eclipse cycle of exactly 521 years which is much more remarkable than the eclipse cycle of 18.03 years called the Saros.

Bode's law has been criticized because Mercury's mean distance is not the first term of the double-progression series. I have met that criticism by showing that it is the 8th term of such a series in which the radius of the sun's molten core is the first term. In my last article, it was shown that bombardment of the sun by high-speed galactic electrons is the most probable cause of the sun's heat; and that therefore its core is no hotter than its surface. From this it follows that it probably has a molten core.

The Earth is encased, as I have previously shown, in numerous electron-shells that reflect radio signals. Some of these reflections occur after 3, 15 and 30 seconds. The one after 3 seconds would come from a shell in which the moon is near apogee or when farthest from the Earth. The radio echo after 30 seconds would come from a terrestrial electron-shell about 1/32 the distance to the sun; and the one after 15 seconds at half that distance; for radio waves travel with the velocity of light.

Even comets at times show multiple concentric, spherical shells that are systematically spaced; and, more remarkable still, when the luminous shell of a comet increases in size as it approaches the sun, it does so by sudden "leaps," the later diameter often being double that of a previous diameter, as in the last appearance of Halley's comet.

Let all planets be encased in concentric electron-shells rotating anti-clockwise when viewed from the north, having diameters that form double-progression series, and it follows that they "feed" electrons and associated molecules into one another. It can be easily seen that this "feeding" would be greatest where planet orbits are so spaced as to form a double-progression series! This explains quite fully why Bode's law and similar laws for satellites exist. There remain several unsolved problems, such as why Jupiter is so great while Ceres and its affiliated planetoids are so small. It seems significant that Ceres is about half way between the sun and Jupiter where the adjacent faces of a solar shell and a Jupiter shell would be moving in opposite directions; whereas in the case of huge Saturn a Jupiter shell at a tangent to Saturn's orbit would be moving in the same direction as the solar shell in which Saturn grew. Even such difficult problems seem not to be beyond solution by aid of the electron-shell theory.

Comets often experience sudden increase in size of head or tail, and often the tail flutters as in a violent breeze. I infer that at such times the comet is crossing either an electron-shell or a stream of galactic electrons; and that inferences as to positions of such shells and streams can thus be verified. Comets may thus serve astronomers as sounding balloons serve meteorologists, for "exploring" regions not otherwise attainable.

Only occasionally has an astronomer voiced wonder at some of the remarkable celestial relationships and expressed hope of explanation, as did Sir John Herschel nearly a century ago when he asked: "Why do the diurnal rotations of Mercury, the Earth and Mars agree to an hour? Why are the densities of the Sun, Jupiter, Uranus (and possibly Neptune) exactly alike and just one-fourth of the Earth? Why are the periodic times of Saturns third and fourth satellites respectively, precisely double those of the first and second?"

The galactic electron-stream theory and the electron-shell theory throw light on each of these questions, and are especially luminous as to the genesis of all types of orbital systems and all types of correlated cycles in different kinds of phenomena.

▼

Charles M. Ziegler Elected Michigan State Highway Commissioner

Charles M. Ziegler was elected State Highway Commissioner of Michigan at the election April 6, defeating the present Commissioner, Lloyd H. Reid, by a majority of about 50,000. Michigan, by the way, is the only state that selects the active head of its highway department by popular vote.

Mr. Ziegler has had extensive experience in the highway field.

Mr. Ziegler is a civil engineering graduate of the University of Michigan. He has been assistant city engineer in his home town of Saginaw, and during the World War was with the U. S. Airplane Division at McCook Field. In 1919 he entered the State Highway Department, serving successively as assistant division engineer, division engineer, state construction engineer and deputy state highway commissioner, until the Republican defeat in 1933. Since then he has been engaged in engineering work in Ingham county, and at present is City Assessor of Lansing. He is a past president of the Michigan Engineering Society.

▼

Victor J. Brown Promoted to Lieutenant Colonel

V. J. Brown

Victor J. Brown, Publishing Director of ROADS AND STREETS, now with the Air Corps has been promoted from the rank of Major to that of Lieutenant Colonel. Colonel Brown is now utilities officer at the Oklahoma City Air Depot, where he is in direct charge of the operation, maintenance, repair and alteration of all public utilities, including roads, railroads, streets, buildings and all machinery and equipment permanently attached hereto.

▼

A.R.B.A. Meeting at Chicago

The annual meeting of the American Road Builders Association, which will be held May 4-7 at the Edgewater Beach Hotel, Chicago, Ill. will deal with fundamental phases of the highway industry's part in the war effort. Planning the peace will receive equal attention with emphasis being placed upon the immediate necessity of going forward with plans, specifications and other details in contemplation of postwar highway construction.

Sessions will be participated in by key Washington officials as well as outstanding representatives of the highway industry and profession. From the deliberations at the meeting the industry will undoubtedly be able to obtain a clearer picture of its responsibilities in the war effort and formulate more comprehensive plans for its important part in the postwar program.

EXPLOSIVES

A Chapter from the Truck Trail Handbook of United States Department of Agriculture—Forest Service

Part 3

Through the courtesy of the U. S. Forest Service, ROADS AND STREETS presents the entire chapter on explosives from the Truck Trail Handbook. The first and second parts were published in December and February. The third installment is given herewith.

The Editor

806. Wiring, Testing, and Firing Electric Blasting Circuits

A. Electric Blasting Equipment

See figure 804.

a. Detonators. Electric blasting caps, or detonators, are fired or exploded by an electric current produced by a blasting machine or other source. The caps are available with different lengths of wires to suit different depths of holes. The size or strength of cap is designated by numbers. The No. 6 is recommended for Forest Service work. See 806 G, Firing.

b. Connecting wire. This wire is No. 20 gage and is furnished for use in splicing electric blasting caps when they are too short to reach between holes.

c. Leading wire. Leading wire is used to carry the current from the blasting machine or power circuit to the electric blasting cap wires in the bore holes and return. No. 14 gage wire is recommended and ordinarily used for this purpose. The ends of lead wires farthest away from the shot should be twisted together before connecting the lead wires to the shots to be fired, thereby making a short circuit and preventing possible premature explosion.

d. Blasting machines. Blasting machines are used to generate current for firing blasts by electricity. Two general types of blasting machines are largely used; (1) a wooden case containing a small generator or dynamo operated by a downward thrust of the rack bar, and (2) a pocket-blasting machine operated by a twist of the hand using a special key. With either machine, success of the shot often depends upon holding the rack bar or twist action handle down until the dynamo quits turning. The capacity is indicated on each machine. The push-down type generally has a capacity up to 50 detonators with 30-foot wires. The twist types generally have a capacity up to 10 caps with 30-foot wires. It is also important that the blasting machine be twisted or pushed down several times to warm up the machine *before connecting the lead wires.*

e. Galvanometer or circuit tester. This is an instrument used by blasters to test individual electric blasting caps; to determine whether or not a blasting circuit is closed and in the proper condition for the blast; and to indicate the existence of leaks or short circuits and the approximate resistance of a circuit.

To test a circuit place one wire on one terminal of the instrument and the other wire on the other terminal. If the needle is not deflected it indicates that the circuit is broken, and if it is an electric blasting cap that is being tested it should be discarded.

A small resistance throws the needle nearly clear over while with a high resistance the needle will not move far. The most valuable use of the galvanometer is to show when a circuit is complete, indicated by a deflection of the needle. The amount of deflection is an indication of the relative resistance in the circuit.

Repairing of galvanometers or replacing of the silver-chloride cell should not be made by field men. The galvanometer should be returned to the manufacturer when repairs are needed.

f. Rheostat. This instrument is used for testing the efficiency of blasting machines. It will tell the number of detonators the current generated in the blasting machine will fire.

The internal construction of the rheostat is an arrangement of coils of high-resistance wire of a certain length with the binding posts at both ends attached to its ends, and the intervening binding posts attached to it at intermediate points. The entire length of the resistance wire in the rheostat has a resistance sufficient to represent a test of one hundred 30-foot electric caps, with a factor of safety to allow for the leading wire, connecting wire, and all connections in the blasting circuit. The resistance wire between binding posts is so arranged that blasting machine tests can be made in multiples of five.

B. Connecting Wires Between Detonators

See figure 805.

a, General. All connections between detonator wires or between detonator wires and connecting wires must be carefully made. Scrape the bare ends of the wires with a knife blade and join them with a long twist, generally known as the Western Union twist. See A, figure 805.

Such a twist should be made tight to keep the resistance in the joint down to a minimum. A quick method of connecting detonator wires consists of placing them side by side, bending the ends to form a short crank and winding them together by turning this crank. This gives a quick tight connection which becomes tighter if pulled. This connection extends at right angles to the wire but, if necessary to tape the joint, this can be bent to lie along one of the insulated wires and the whole taped in the same way as any other joint. If there is no bare end to the connecting wire, skin off about 2 inches of the insulation. Never, under any circumstances, loop wires together.

b. Series connections. When using a blasting machine all rounds must be wired in series. This is done by connecting one wire from each hole to a wire from the adjoining hole, and so on to the end, when the two free wires are connected to the leading wire.

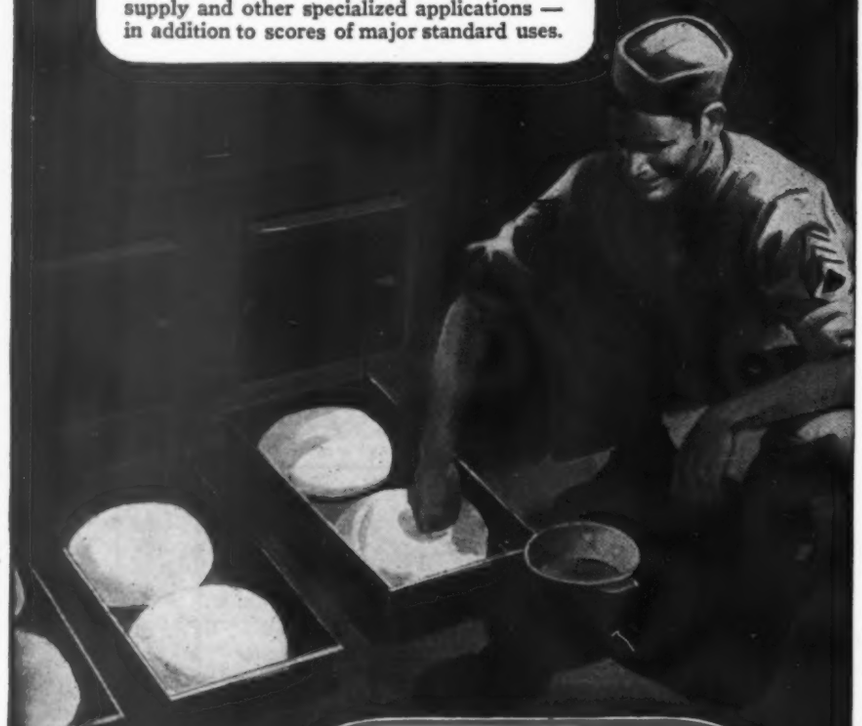
c. Connecting detonator wires to lead wires. In making this connection, the ends of the wires must be cleaned. Wrap the detonator or connecting wires tightly around the end of the lead wire about 1 inch from the end. Then bend the end of the lead wire back sharply and take a turn or two

SIZE AND SPACING OF DIMENSION LUMBER FOR VARIOUS WIDTHS
DIMENSION NO. WIDTH OF MAGAZINE
GIRDER
FLOOR JOISTS
CEILING JOISTS
RAFTERS
COLLAR BEAMS
12'C
15'C
12'C
15'C
2'0"C
10
12
14
16
18
20
WALL
ALL LUMBER TO BE FREE FROM LOOSE KNOTS, WIND SHAKES, BARK EDGES, OR DECAY
ALL MATERIAL AND WORKMANSHIP TO BE FIRST CLASS.
ALL METAL TO BE SCREENED TO BUILDING WITH GALV NAILS AND LEAD WASHERS
NUMBER AND DIAMETER OF VENTILATORS WILL BE DETERMINED BY CLIMATIC CONDITION AND LENGTH OF BUILDING.
SIDE ELEVATION
SIDE ELEVATION SHOWING SPACING OF DOORS AND VENTILATORS
MAGAZINE DESIGNED FOR HIGH EXPLOSIVES. ALSO SUITABLE FOR BLASTING AND SPORTING POWDERS AND BLASTING SUPPLIES.
PLAN
CROSS SECTION 'A-A'
LONGITUDINAL SECTION

Fig. 806. Standard sand-filled magazine

AND WE HAD "Real Bread"

"Our boys," in distant lands, get *real bread* — made the American way in "portable" kitchens. Just another way Briggs & Stratton gasoline motors are serving — furnishing power for bread mixers, refrigerators, water supply and other specialized applications — in addition to scores of major standard uses.



We're in full production on Briggs & Stratton 4-cycle, air-cooled gasoline motors — for the war program and approved "essential" civilian uses — but there are not enough "new" motors available to supply the demand. As a special service, we are trying to place "used" Briggs & Stratton motors that may not now be in active service, in the hands of those who need them so badly.

If you have, or know of any Briggs & Stratton motors not now in regular use—please write us, stating model numbers and general condition. It makes no difference how old they are. We will assist in making contacts between owners and prospective purchasers.

BRIGGS & STRATTON CORP.
MILWAUKEE, WIS., U. S. A.

4 CYCLE
BRIGGS & STRATTON
GASOLINE MOTORS

FOR VICTORY
Invest in
WAR BONDS

of the detonator wire around the loop. This last loop is simply to make a stronger connection to withstand any accidental pull on the lead wire that might tear the connection loose.

d. Connecting lead wires to blasting machine. The connection of lead wires to the older type of blasting machine is made by loosening the nuts on the two binding posts, inserting the ends of the lead wires into the two small holes in the binding posts, and tightening the nuts down on the wires. With some of the newer types of pocket blasting machine which have spring posts, it is only necessary to slip the wires between the two sections of the posts.

When using a duplex wire, the line should be tested frequently as the wire sometimes breaks within the insulation. Breaks in a single lead wire are easily found by drawing the wire through the hands causing a slight bend.

C. Protection of Bare Joints in Wiring

The naked joints in the wires of a blasting circuit must always be protected against short circuiting, especially through water. This is done in several ways. (1) When connections lie on moist ground, they may be held up by supporting them on stones, blocks, or sticks, so that only the insulated parts of the wires touch the ground and supports. (2) The joints may be insulated with tape. While not generally needed where the joints can be held off the ground, the taping of the joints is strongly recommended where the joints are covered by tamping, where they cannot be held out of the water on props, or where blasting must be done during a rain storm.

D. Care of Lead Wires

The proper care of leading wire is simple. After using, it should be coiled and hung up out of the way; under no circumstances should it be dragged over the ground. Lead wire reels are very convenient and their use greatly prolongs the life of the wire.

To uncoil a wire properly make one end fast; hold the coil in an upright position with the wire leading from the bottom of the coil and lay out by rotating the coil away from the point at which the end is made fast. It will be more convenient to handle the coil if the operator can walk backward, paying the wire out as he goes. If two or three coils are separated when dropped on the ground and the wire pulled, it may spiral out straight; more often it will kink.

To recoil a length of wire, it is im-

portant that the first turn be tied. If this is not done, it is very inconvenient and almost impossible to make a coil that will unwind readily.

Frequent inspections of the lead wire should be made for the purpose of locating breaks in the insulation. If breaks are discovered they should be taped immediately to prolong the life of the wire and prevent possible misfires.

E. Testing a Blasting Circuit

After a round has been wired, the circuit should be tested with a galvanometer to make sure that there are no breaks in the line. See 806 Ae, Galvanometer or Circuit Tester. A very accurate way is to test the wires from each loaded shot; or, by using a small back line, test each shot wired to the main round to be sure none of the detonator wires were broken during the loading.

F. Care of Blasting Machines

Do not allow the blasting machine to remain uncovered overnight or to remain out in wet or damp weather. Care in handling is necessary to insure good results from firing the round.

The bearings and gears should be lightly oiled occasionally. Use a little graphite on the commutator, which is the small copper-covered wheel on the end of the armature shaft. See that the two slots cut in the copper part of the commutator are clean, with no particle of metal or anything else in them which might cause a short circuit. Keep the copper brushes clean and see that they bear firmly on the commutator. Keep the circuit-breaking contacts clean and bright.

A blasting machine should be kept in a tight clean box and removed only when it is to be used. When a blasting machine is not in use, store it in a dry and comparatively cool place, not in a leaky tool box or in the open. Test the machine occasionally with a rheostat.

G. Firing

All shots shall be fired with electric blasting caps.

a. Current necessary to fire electric blasting caps. The firing of an electric cap is caused by an electric current heating the cap's bridge to the temperature necessary to ignite the priming composition. The time required for the current to ignite the priming composition varies in caps. This time variation can be overcome only by using a current so high that the bridge of the slowest cap will be raised to the firing temperature before the quickest cap explodes and thereby opens the circuit.

Exhaustive tests have been made by the Bureau of Mines to determine the cause of failures of center shots in blasting circuits. These misfires are due to leakage, generally in wet ground. The detonators near the positive end will fire because little leakage has occurred; those near the negative end will fire because enough current has returned to the circuit. The middle detonators misfire, not necessarily because the current is too small to fire the detonator, but because it is not enough to heat the bridges sufficiently to fire them before the firing of the end detonator has broken the circuit.

Under ordinary blasting conditions there is more or less leakage through the small thinly covered detonator and connecting wires. To avoid misfires by current leakage, a straight series connection should be limited to fifty shots.

b. Safety in firing. Do not fire until you are sure that all charges are properly loaded and stemmed and that all persons, animals, and machinery are at a safe distance from the shots. Stump fragments and rock are sometimes thrown a considerable distance. Helpers should be stationed on each side of shots to warn anyone approaching. As a safety precaution, instruct the crew as to the meaning of the shouted "FIRE" warning, and the number of times the word will be shouted before firing. *One man only* should be allowed to fire a round of explosives. This man should always be the last to leave the danger zone.

Blasting machines with 50-shot capacity should be used where shots are numerous. Smaller machines can be used to good advantage for springing and where from 1 to 10 shots are to be fired in a round.

After the line has been tested, work the rack bar up and down vigorously 4 or 5 times to warm up the magneto. Then hook the blasting machine to the line and plunge the bar to the bottom of the machine to make contact. Hold the rack bar down until the magneto stops turning.

If the blaster cannot get under safe cover he should always face the blast with his back to the sun, as this gives him the best chance to watch and avoid any flying matter.

After a blast is fired, the blaster, before returning to look over the result, should wait long enough to allow the falling material to drop, and the smoke, fumes, and dust to be partially dissipated or blown away.

Make sure no fires have been started.

c. Precautions against fire. During dry fire-hazard weather, a patrolman should be stationed at all places where recent shooting has occurred, particularly during the noon period and in the evening for one hour after the crew has left the job. The patrolman's duty is to spot and control any fires that might have been started.

The explosive foreman should keep in close touch with Forest Service officials during high fire-hazard weather and only shots necessary to avoid costly delays should be fired. This precaution should be strictly observed where shooting is close to dry inflammable material.

H. Handling Misfires

a. General. Handling a misfire is by far the most hazardous duty any blaster is called upon to perform, and he should proceed with every precaution for his own safety and that of other men on the job.

Misfires are much easier to prevent than to cure. Careful priming and loading will reduce the chances of shots failing to fire. Test each cap with a circuit tester before loading, before tamping, and after tamping. When a misfire does occur the blaster should be governed by conditions and make a careful investigation.

All misfires should be the responsibility of a careful experienced workman, who should make his examination in a slow methodical manner before repriming. See Safety Rule 28.

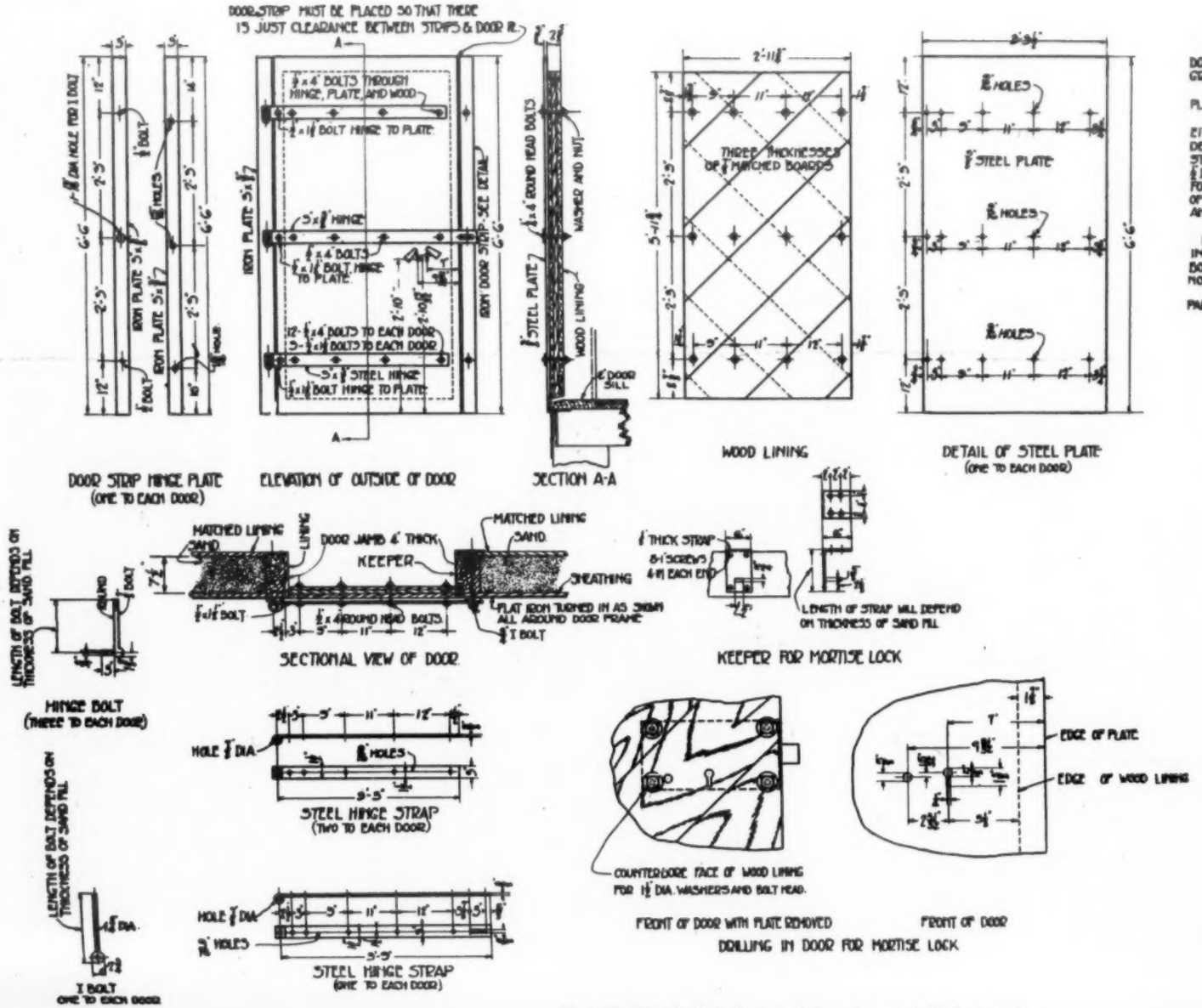
b. Disconnecting wires. When one or all of the holes fail, disconnect the wires from the blasting machine before going back to investigate the trouble.

c. Galvanometer tests. Try the galvanometer to see if the circuit is complete; if not, search for broken wires and faulty connections. If poor connections are found, make the proper repairs, reconnect the lead wires and retest the circuit. See 806 Ae, Galvanometer or Circuit Tester. Many failures are the result of connections in contact with wet ground or other conductive material.

d. Holes stemmed with water. If the missed hole is stemmed with water, make up another primer, place it on top of the charge, and fire.

e. Holes stemmed with solid material. If the hole is stemmed with solid material, lead and fire another charge far enough away for drilling in safety,

(*Continued on page* 66)


DOOR STRIP MUST BE PLACED SO THAT THERE IS JUST CLEARANCE BETWEEN STRIPS & DOOR JR.
DOOR STRAP HINGE PLATE (ONE TO EACH DOOR)
ELEVATION OF OUTSIDE OF DOOR
SECTION A-A
WOOD LINING
DETAIL OF STEEL PLATE (ONE TO EACH DOOR)
SECTIONAL VIEW OF DOOR
KEEPER FOR MORTISE LOCK
HINGE BOLT (THREE TO EACH DOOR)
STEEL HINGE STRAP (TWO TO EACH DOOR)
I BOLT ONE TO EACH DOOR
STEEL HINGE STRAP (ONE TO EACH DOOR)
FRONT OF DOOR WITH PLATE REMOVED
FRONT OF DOOR
DRILLING IN DOOR FOR MORTISE LOCK

SPECIFICATIONS

DOOR TO BE BUILT OF THREE THICKNESSES OF 1" TONGUE AND GROOVE HARDWOOD BOARDS LAID DIAGONALLY.

PLATE AND PARTS OF 1/4" WROUGHT IRON OR STEEL.

EITHER PAD LOCK OR MORTISE LOCK MAY BE USED, OR BOTH IF DESIRED. IF MORTISE LOCK ONLY IS USED, MAKE ALL HINGE STRAPS OF THE SHORTER LENGTH, AND REPLACE 'T' BOLT WITH 1/2" DIA CARRIAGE BOLT. IF PAD LOCK ONLY IS USED, OMIT KEEPER FOR LOCK BOLT AND DRILLING IN PLATE SHOWN IN DETAIL OF MORTISE LOCK. USE ONE LONG HINGE STRAP FOR HASP AND 'T' BOLT FOR STAPLE.

MORTISE LOCK MUST BE PUT ON WITH BOLTS AS SHOWN IN DETAIL, NOT WITH SCREWS.
BOLTS TO EXTEND ENTIRELY THROUGH THE WOOD BACKING, BUT NOT THROUGH THE METAL PLATE

PAINT DOOR PLATE AND STRIPS TWO COATS BLACK METAL PAINT

Fig. 807. Standard bullet-proof door for sand-filled magazine

"New vs. Old" method of spring clean-up on Albany's streets

Albany Speeds Spring Street Cleaning With Snow Loader

ONE of the big spring jobs of the Albany, New York, Bureau of Streets, is the cleaning up of winter trash and icing cinders. Ordinarily gangs of shovelers and pick-up trucks, aided by street sweepers, take two or three weeks to finish this task. Albany has always taken pride in its 238 miles of well kept streets.

This year, however, manpower was scarce, and to save labor one of the City's snow loaders is used to pick up street trash and dirt. The procedure is for the ten street sweepers to stock-pile all sweepings at the junction points between sweeper routes. About 20 or 25 dumps are piled along the curb in a windrow. Then the loader backs along the curb and picks up the dirt, with two trucks hauling away. A 30-ft. windrow is cleaned up in ten or fifteen minutes, and the crew is quickly on the way to the next stock-pile location. Three men—two looking after the loading of the trucks, and one driver—do the work of two or three times that many hand shovelers, and do it quicker. The entire job was cleaned up in a week. While the city has five snow loaders, most of this work was done with a single Nelson unit, equipped with a collecting screw.

The winter street refuse is so heavy with cinders and grits that it loads well except in the windiest weather. A canvas hood is sometimes hung around the chute.

The use of snow equipment for other than snow started last year when the Autumn leaves were removed with a loader. Leaves were piled up by the sweepers, sometimes for two hundred feet along the curb, and loaded into trucks while damp. The snow pick-ups also take up ice. Gutter ice and consolidated snow are broken out in chunks with hand picks and piled for mechanical loading.

Albany's deputy street commissioner, John Wallace

The foregoing information was supplied by John G. Wallace, deputy commissioner of streets in charge of maintenance. K. W. Marsh is Albany's commissioner of streets.

▼

Asphalt Institute Elects Officers

At their annual meeting the Board of Directors of The Asphalt Institute, representing most of the major petroleum asphalt producers of the United States and Canada, re-elected Herbert Spencer president of the organization for the ensuing fiscal year. J. A. Blood, Standard Oil Company of California, was made Chairman of the Executive Committee—C. W. Barbour, Allied Materials Corporation, H. B. Pullar, Berry Asphalt Company, David Waxman, Shell Oil Company and Herbert Spencer completing the Committee. Bernard E. Gray was promoted from the position of Chief Engineer to that of General Manager and Chief Engineer of the Institute.

Other officers elected were: Vice-presidents, C. W. Barbour, Allied Materials Corporation; A. M. Maxwell, Standard Oil Company (Ohio); Glenn Nielson, Husky Refining Company; H. G. Nevitt, White Eagle Division, Socony-Vacuum Oil Company, Inc.; H. B. Pullar, Berry Asphalt Company; F. V. Widger, The Texas Company; and Roger Williams, Standard Oil Company of Louisiana. George R. Christie, Standard Oil of New York, was elected Secretary and Treasurer, with John N. Smith of the same Company as Assistant Treasurer.

This is an increased number of vice-presidents, elected by the Board to meet the need of bringing key officials of the asphalt industry in closer touch with Institute activities. These seven vice-presidents represent repectively the seven regional divisions of the United States additional to the Pacific Coast territory.

Asphalt tonnage, despite curtailment of shipping facilities to the Atlantic Seaboard, continued at practically the record-high level of 1941, U. S. Bureau of Mines figures for 1942 showing a reduction of but 2 per cent. Shortages were not permitted to cut Army and Navy needs, and the use of asphalt for airport development was maintained as far as practicable.

Fig. 807. Standard bullet-proof door for sand-filled magazine

Editorial

Pennants Due Road Shops

WHILE pennants are being awarded for all-out effort, we think a few honors should go to highway and street department shop crews.

Without fuss or fanfare many of these fellows have applied salvage techniques to the limit. The best of them have in fact shown a remarkable ingenuity in rebuilding worn-out parts and assemblies, making new parts from scrap, and in rigging up complete machines a-la-Rube Goldberg at times. Without this effort, surface maintenance, snow removal, ice control and other essential services would gradually lapse in many communities and loud would be the lamentations, miltary and otherwise. With this effort, and thanks to it, road crews are rolling today after a hard winter, on a half-billion dollar spring maintenance job.

The vital importance of highway maintenance to the war program and the civilian economy isn't seriously questioned. Under priority substantial quantities of road materials are being released for maintenance. But parts will continue to be scarcer than hen's teeth and lucky is the state, county or city that has good shop facilities and is able to hang onto experienced foremen and machinists.

Winter Concreting Advances

Winter concreting is nothing new. Innumerable buildings, bridges and other structures, and a few pavements have been placed in cold weather. But it has remained for the airport builders under stress of war to demonstrate the full possibilities of large-scale winter paving with concrete. Protective methods employed on several large airfields this past winter made possible their completion months ahead of time.

It is too early to have full conclusions from the extensive data gathered on these jobs. But several fundamentals are underscored. One is that you can build a satisfactory pavement under quite severe conditions if you can finish it and get it under cover.

Another is that where extra speed is not essential, construction costs need not be excessive. Added costs for winter protection on one big eastern and a still larger western job, where temperatures during four winter months dipped occasionally toward zero, are reported as being entirely satisfactory. The actual costs will make interesting reading. In peacetime there are many circumstances on streets or roads involving costly traffic interruption, where a differential of ten to twenty-five per cent is a small price to pay for early completion. Better cost data are needed to help decide when winter paving is justified.

A big word in winter paving is control. Where inferior or spotty jobs have resulted in past winters, the trouble has probably been due to lack of proper controls. Frequent temperature checks are necessary all along the way—subgrade, aggregate piles, bins, water, mixer, dumped batches, freshly finished pavement, slab and subgrade during setting and hardening. These checks show quickly whether heating and protection methods are okay.

Another big word is uniformity. Lack of uniformity of batches, especially as to moisture content and temperature, has an effect on the pavement during the hardening period. It is hoped that this factor can be more clearly evaluated from the past winter's work, and the data translated into practical working rules.

One more word: subgrade. It isn't always practicable on road or street jobs to protect the subgrade from freezing in the fall. But here is a chance for large economy since the need for replacing frozen material is avoided.

The decades before Pearl Harbor witnessed a gradual but continual speeding up of road building, culminating in such fast jobs as the Pennsylvania Turnpike. Now time is a military factor. When normal construction programs are resumed, time will again be primarily an economic factor, and a major one. Undoubtedly post-war construction will include an increasing amount of winter work. In an early issue ROADS AND STREETS expects to tell of the progressive methods used on one of the big winter airport jobs.

School Bells

The Ohio highway department is to be congratulated on its effective foremen instruction schools, conducted during the last few weeks. "The most up-to-date and practical system I have yet observed," is the verdict of a well known leader in highway maintenance who is familiar with the procedure.

In the past, this kind of thing has been done on a hit or miss basis. The Ohio schools are of special interest now that maintenance executives are faced with breaking in a lot of green men and helping all hands get the hang of emergency methods and substitute materials. Scientific training of men to increase their individual efficiency and "know how" should be a year-'round, continuing effort in highway and municipal organizations.

NO PRIORITIES ON **WAR BONDS**

Next to the Stars and Stripes, Cletrac is proud to be flying the Minute Man flag. Over 95 per cent of Cletrac employees are purchasing War Bonds by pay roll deduction.

★ No eider-down hangars, these. There are rocks, humps and stumps to move; soft spots and hollows to fill; billiard-table smoothness to be achieved—that our birdmen may have safe and level landing places. No soft snap, this job. It requires rugged power and the ability to stand rough treatment—in short, a Cletrac—the tractor that can take it.

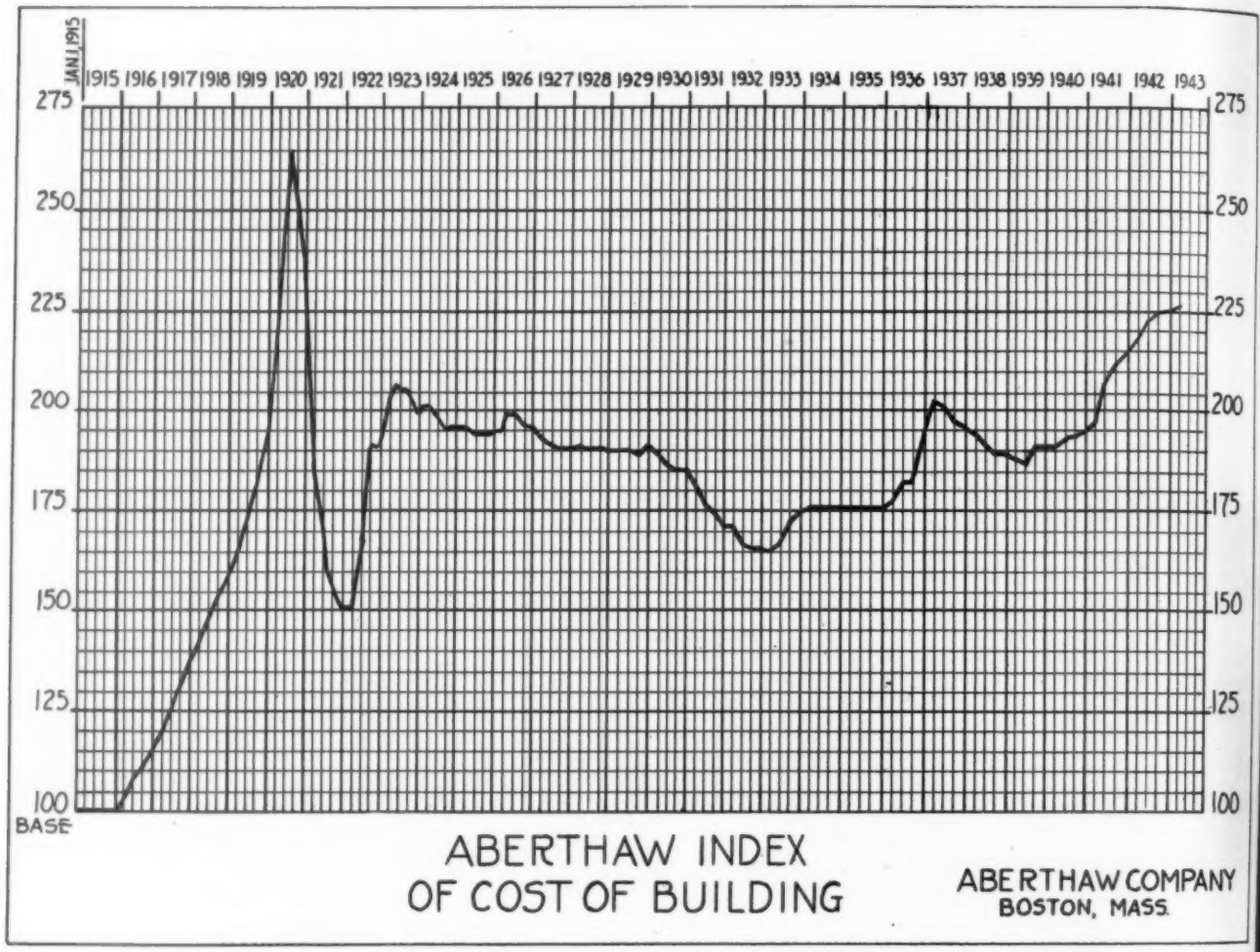
TO CLETRAC OWNERS. Prolong the usefulness of your Cletracs by proper lubrication and prompt replacement of worn parts. Take advantage of the built-in durability of your Cletrac by frequent inspection and careful maintenance. Your Cletrac dealer is anxious to help you conserve *all* of your equipment. Ask his advice.

THE CLEVELAND TRACTOR COMPANY
CLEVELAND, OHIO

Cletrac Crawler Tractors

GASOLINE AND DIESEL

Construction Cost Index



Aberthaw Index of Cost of Building

The accompanying cost index curve, though prepared for use in the building industry, is of interest to road builders and others engaged in heavy construction because the costs of all classes of construction follow roughly similar trends (for certain important indexes of highway construction and a general discussion of the subject, see the second chapter of "Road and Street Construction Methods and Costs" by Gillette and Black).

The Aberthaw Company, construction managers, of Boston, Mass., who have published this index for many years, present the following explanation of the increase for the third quarter of this year.

The Aberthaw Index of Cost of Industrial Building for the quarter ending March 31, 1943, makes a small increase to 226.7. This is due to slightly firmer prices on certain building materials. The cost of labor remained steady throughout the period. A study of the chart clearly shows that while the cost of building has been advancing during the present World War the percentage of advance during the year and a quarter that the United States has been engaged is decidedly less than was the case during the corresponding period in the first World War. In the earlier War the index stood at 120 in April, 1917 and advanced to 147 fifteen months later, an increase of about 22½%. By contrast it stood at 215 in December, 1941 and now fifteen months later has advanced to 226.7, an increase of about 5½%. Apparently, inflation controls have, to date, been much more effective than in the previous War insofar as the building industry is concerned.

How much does a good pot-hole cost?

TINKERED and humored into lasting far beyond its time, this venerable cargo jalopy may not look important, but it is! It carries food enough for several hundred fighting men and workers — for what may be delayed or lost by the wayside because of a pot-hole in the road.

How much does a good pot-hole cost? "Say brother, plenty!" say men who know. For millions of trucks daily ply our highways from farm to market and from mine and mill and plant, over ... Roads that need repair can take an increasingly serious toll from this vital traffic. There's no calculating what they cost in excessive wear to tires and damage to cars, in accidents, delays and lost man-hours. Neglected pot-holes grow steadily bigger, steadily more dangerous and increasingly difficult to repair.

THE above is taken from a Barrett Tarvia advertisement in The Saturday Evening Post—a message telling American people of the vital war-time importance of road maintenance and repair.

Today millions of trucks ply our highways and back roads, from farm to market, and from mine and mill and plant. And many more millions of automobiles carry industrial workers to and from their jobs.

That is why it is so vitally important to concentrate upon *maintenance* in 1943. Highway engineers and officials are having to make limited appropriations and supplies work overtime. Why not discuss your problems with the Tarvia field man? He can help you make a little do the work of a lot. Remember; there's a right type of Tarvia and a right Tarvia method for the maintenance and repair of almost every type of road.

*Trade-mark Reg. U. S. Pat. Off.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK

New York · Chicago · Birmingham · St. Louis · Detroit · Philadelphia · Boston · Providence
Rochester · Minneapolis · Cleveland · Columbus · Toledo · Youngstown
Syracuse · Buffalo · Cincinnati · Bethlehem · Portland, Me. · Bangor, Me.
Norwood, N. Y. · Cromwell, Conn. · Norwich, Conn. · Savannah, Ga. · Norfolk, Va.
In Canada: THE BARRETT CO., LTD. · Montreal · Toronto · Winnipeg · Vancouver.

Barrett Tarvia*

New Design of Standard for Traffic Stripe Flags

By T. W. MARTIN
Maintenance Superintendent, California Division of Highways, Whittier, Calif.

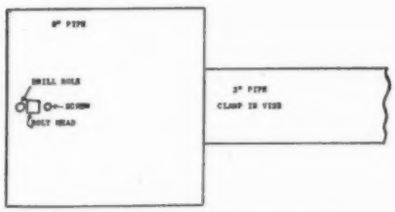
IN ORDER to protect newly painted traffic stripes until completely dried, we use pieces of red flagging tied to wire standards. Although many types of standards had been used it was found we needed one that would be:

1. Rugged.
2. Easily made.
3. Easily repaired.
4. Able to withstand air suction without turning over.
5. Light in weight.
6. Of a design that would permit large numbers being carried in a small space.

The design finally adopted was made of No. 9 galvanized wire with a circular base of 8-in. diameter and an upright of between 8 and 9 in. Pipes fastened to the sides of our striping trucks are used to carry the standards and, as they fit closely together, large numbers can be transported and used as needed. With the upright bent towards the center of the base, these standards have been found to stand up well on high speed traffic routes.

The jig used to form the standards is a short section of 8-in. pipe welded to an 18-in. length of 3-in. pipe. The 3-in. pipe is clamped in a vise or securely fastened to the top of a bench. A hole large enough to accommodate the wire is drilled through the 8-in. pipe ½ in. from the end. Another hole is drilled ½ in. from the first and a bolt is placed therein with the square head on the outside. The third hole is drilled 1¼ in. from the end of the pipe and a bolt or screw inserted with about 1 in. showing outside of the pipe.

Using cut sections of wire 36 in. long, one end is inserted in the drilled hole to a depth of ¾ in. This is then bent at right angles forming a loop which will later be closed to tie to the upright.



Jig used to form the standards

After bending the right angle the wire is wrapped around the pipe forming the 8-in. circular base.

The wire is then brought between the protruding bolt head and screw and again bent at right angles, forming the upright portion of the standard.

The wire is then removed from the pipe and the opposite end is inserted in the drilled hole and another right angle is bent. This forms the loop in which the red flagging is tied.

The wire is then placed on a bench and the upright bent in so that the upper loop is above the center of the base.

After closing both loops with hammer blows, the strips of red flagging are tied in the upper loop, forming the standards.

Men in War Work

More than 800 employees of the New Jersey State Highway Department are now in the armed forces or in war work requiring specialized training, according to state highway commissioner Spencer Miller, Jr.

"The call for the service of our staff," the Commissioner continued, "is a tribute to our entire State. It reveals wide recognition of these men as leaders in thought, action and efficiency, an enviable reputation that is known even to our Allies.

"Of the 800 men who have left us, 341 are serving in every branch of the uniformed service—many across the seven seas. They are in the Seabees, Signal Corps, Infantry, Artillery, Cavalry, Aviation, Engineering, Medical. In fact, they are giving their talents for every division composing the invasion units.

"We take special pride in the knowledge that a number have been advanced to high rank and are now the commanders in large units.

"Those who have gone to carry on in a civilian capacity, have also been placed in positions of responsibility. Some are instructors in radio, mathematics, map preparation, blue print reading and other detailed activities.

"Regulations on censorship prevent us from revealing names and special types of work, but they will later fill laudable chapters in the history of the Department.

"We have complied whenever possible with the requests from the Army, Navy and industrial plants for the assignment of our trained corps in limited or extended work. This cooperation has frequently handicapped us as the Highway Department is the agent for both the Army and Navy in the construction of access roads to Federal reservations and war plants.

"Our depleted staffs, however, have volunteered extra hours of duty to carry on. Through their loyalty and patriotism we have been able to establish speed records by completing approach roads far in advance of stipulated time schedules."

From the ALCAN to the PAN AMERICAN Highway—

Pioneer

Pioneer plants serve on every front. They are used on the tough rock jobs on the Alcan Highway and on the Pan American Highway. Both contractors and U. S. Engineers prefer Pioneer plants for producing their surfacing aggregates for highways and airports.

PIONEER ENGINEERING WORKS, Inc.
MINNEAPOLIS, MINNESOTA, U. S. A.

Georgia's Steel and Timber Bridge Maintenance

Paint Gangs Accompanied by Welder—Rusted Sections Replaced With Scrap Iron—Substitute Grades of Lumber Used—Pine Oil Vat Treatment Helpful

By M. S. STEADMAN
Maintenance Engineer, State Highway Board of Georgia

MANY of our bridges are in urgent need of rebuilding, but due to the shortages of strategic materials involved they must be deferred for the duration, and in the meantime they must be maintained and strengthened to meet the added demands placed upon them.

In general, our reinforced concrete bridges are capable of carrying the heavy loads to which they are subjected and only preventive maintenance is required to keep them in safe condition.

Steel structures require more protective maintenance, although comparatively little is required if necessary protective measures are taken at the proper time. These steel structures are always exposed to the elements and it is most important that they be kept well painted at all times to prevent the steel from being exposed to the weather and becoming infected with rust. This is especially true near the coast where steel is exposed to salt air and will rust rapidly if it is not kept thoroughly coated with paint.

In Georgia we are carrying on an extensive program of painting and repairs to steel bridges. In our coastal section many of these bridges had become badly infected prior to the beginning of our painting and repair program, and where rust has made serious inroads into the steel we are making welded splices before painting. We have a crew devoting full time to this work in the coastal section of the state. This crew is equipped with a sand blasting outfit for removing old paint where it is loose and cleaning the steel thoroughly before painting. A welding outfit is kept with the crew and when, after sand blasting, it is found that rust has weakened a member, a splice is made by welding. Material for these splices is secured from abandoned steel bridges that have been salvaged. We have found it very difficult to hold this usable salvaged bridge material for this purpose as representatives of the War Production Board are constantly urging us to place this material at the disposal of scrap dealers to be placed in the war effort as scrap, but we feel that the salvaging of members that can be used in our bridge repairs is to the best interest of all concerned. Of course, there are many steel members on abandoned bridges that we cannot use and they are sold as scrap along with our scrap steel from other sources. We feel that the repairs made by this bridge painting and repair crew have been most effective and that the cost has been negligible compared with the results obtained.

We are painting these steel structures with red lead followed by aluminum paint on members exposed to view and graphite paint on the underside of structure. When our present supply of aluminum paint, which we had on hand prior to restrictions, is used up, we will change to white lead. Due to the enormous number of steel bridges we have that are urgently in need of painting and repairs, it appears probable that it will be necessary for us to put on additional crews to complete this work.

Timber Structures a Problem

Our most serious maintenance problem on bridges in Georgia is with our timber structures. We have an enormous number of these timber bridges and many of them are major bridges on heavily traveled routes. We have several timber bridges that are more than a mile in length and in most cases they have already outlived their life expectancy. With the present restrictions on softwood lumber, it is practically impossible for us to secure the better grades of untreated, longleaf, yellow pine or black and red cypress, which abound in Georgia and which we have been accustomed to use in great quantity. With the priority rating we have been able to get on maintenance, we have been unable to get creosoted lumber in any quantity. We are therefore, forced to use low grade, untreated timber, except in some sections of the state where we are able to get good grade white oak and post oak in limited quantities and this is very satisfactory.

As a substitute for the better grades of untreated yellow pine and cypress lumber and the pressure-treated creosoted timber, we have found it necessary to use a considerable quantity of the lower grades of untreated pine on secondary routes and on more important routes we have used a considerable quantity of this lower grade treated in our vats with pine oil by immersion methods. We find that this pine oil vat treatment adds materially to the life of this sap timber and is a fairly good substitute under present conditions. There are a number of pine oil treatments on the market that can be used in the open vat treatment of timber. However, we have used only two of these and both have proved fairly satisfactory.

We found that this material used in sign posts and bridge flooring placed in service alongside untreated timber of equal grade showed a very marked superiority. At the end of a three-year test on sign posts and flooring, we found that pine oil treated timbers were in good condition while untreated sap timber of equal grade was badly decayed. There are other vat treating materials, such as salts and creosote oils, that no doubt have good preservative qualities and would make good substitutes for pressure-treated creosoted material.

Extra Piles Driven

The use of substitute materials for the emergency is not our only problem on timber bridges. It is necessary we also substitute methods to bring these bridges, which in many cases are not capable of carrying the loads to which they are subjected, up to the required loading capacity. We are doing this by driving extra piles where necessary and, in some cases, inserting posts on mud sills to strengthen the bent, and adding an intermediate framed bent on mud sills to long spans.

Additional loading capacity to take care of unusually heavy loads can be secured by the addition of stringers

through the central section for a width of approximately five feet each side of center line, and inaugurating one way traffic for extra heavy trucks. These extra stringers can be placed without removing flooring by the use of timbers of approximately two inches less vertical dimension than original stringer on two-inch blocks. The placing of a bituminous mat on timber bridges will increase the loading capacity by removing irregularities in the riding surface and thereby reducing the impact.

Protection from fire hazards is another important item. It is extremely important at this time that the areas under and adjacent to timber bridges be kept clear of all debris and materials that could become easily ignited, creating an extreme fire hazard to the bridge, and provision should be made for water barrels filled with water at sufficiently close intervals on the bridge for use in case of fire.

[Note: The foregoing article is from a paper given by Mr. Steadman at the recent Southeastern States highway conference at Chattanooga.]

* * *

The article "Design of Flexible Pavement Foundations", by T. A. Middlebrooks of the Chief of Engineers' office, published in our March issue, was originally presented before the A.A.S.H.O. December meeting at St. Louis. Naturally we meant to credit this as one of the meetings' excellent papers, and hasten to do so now.

▼

Alcan Highway Ferry Used River Current for Power

Last summer this large river on Alcan Highway was crossed during most of the season by means of a ferry propelled by deflecting the stream current. Lacking sail, motor or oars, the builders strung a cableway across and fastened the barge to a two-wheel trolley by means of two anchor ropes of adjustable length. The barge was made to move in either direction simply by turning its flat side at an angle with the current.

Not shown in the accompanying photos, supplied by Col. John W. Wheeler, is the simple cable anchorage. The cable at either bank passed over a tripod of poles and to a deadman in the bank.

▼

12 States Legally Prepared to Build Express Highways

Twelve states already have the necessary laws and seven others are now considering legislation that will enable them to build the express "highways of tomorrow" when peace comes.

States now legally prepared to construct limited-access highways are: California, Colorado, Connecticut, Louisiana, Maine, Maryland, Michigan, New York, Ohio, Rhode Island, Virginia and West Virginia.

California and New York are actually developing detailed plans and specifications for limited-access highways for post-war construction. This advance engineering work is a joint Federal-State undertaking which is being financed from a special $10,000,000 fund authorized in the Defense Highway Act of 1941 and from State funds.

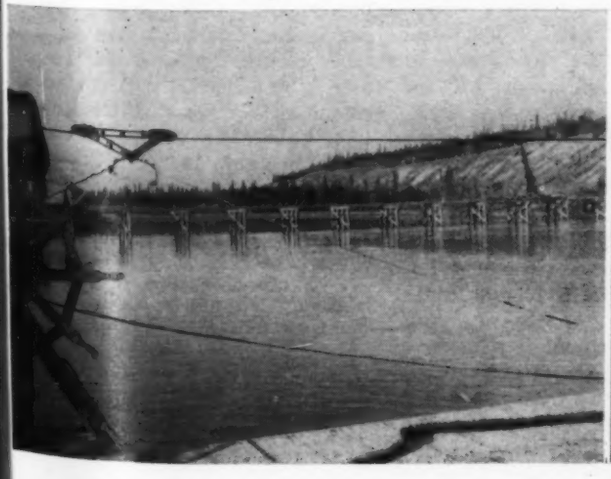
States with limited-access highway legislation under consideration include Arizona, Delaware, Massachusetts, New Hampshire, New Jersey, New Mexico and Utah.

▼

In conference at the Vermont Society of Engineers' recent annual meeting: Maj. Alton D. Taylor, prof. of civil engineering, Norwich University; retiring president J. B. Johnson, of Bryant Chucking Grinder Co., Springfield; new president Tyler W. Earle, Rutland contractor; and Lester W. Richwagen, WPB district manager, Montpelier. Major Taylor and Mr. Richwagen were among the speakers. Harold J. McKeever, associate Editor of ROADS AND STREETS, addressed the convention banquet with a slide-talk on Alcan Highway.

Tyler W. Earle Heads Vermont Society

Tyler W. Earle, of the Rutland contracting firm of Earle and Merry, was elected president of the Vermont Society of Engineers at its recent annual meeting at Burlington, succeeding Joseph B. Johnson of Springfield, Vt. Hubert E. Sargent, Vermont state highway engineer, is 1st vice pres.; A. D. Butterfield of University of Vermont, 2nd vice pres.; Lloyd F. Hayward, chief draftsman of Vermont highway department, Montpelier, secretary; Erwin T. Lavery, ass't city engineer of Burlington, treasurer. Directors are Floyd W. Moore, gen'l manager of Vermont Structural Steel Co., Burlington; Alfred J. Runnals, road engineer, Vermont highway department; and James A. Bullard, University of Vermont, Burlington.



DIETZ LANTERNS ARE MADE OF SCARCE MATERIALS

— here's how your maintenance men can keep them in good condition.

Always keep filler hole covered—if cap is lost, replace it. Occasionally, when fuel is low, drain out the fount to remove any accumulated moisture to prevent pitting, leaks, etc.

Keep wick properly trimmed — replace it when necessary.

To properly trim wick, cut straight across top—trim away any extended or loose threads, nick the corners slightly

Keep globes clean. Dirty globes reduce visibility. Replace damaged ones.

Don't turn wick too high. This creates soot, clogs tubes, reduces air flow, cuts down candle power, wastes kerosene.

KEEP A SUPPLY OF DIETZ LANTERN REPLACEMENT PARTS ON HAND

We recommend that you keep on hand an inventory of extra DIETZ Lantern Red and clear globes, and wicks for instant replacement for every need and emergency. Your supply house can furnish DIETZ burners, filler caps, etc.

DIETZ LANTERNS

R. E. DIETZ COMPANY

1840 NEW YORK 1943

Output Distributed Through the Jobbing Trade Exclusively

Explosives

(*Continued from page* 55)

but close enough to cause detonation by concussion or sensitivity.

f. Redrilling a misfired hole. When a second hole is drilled, place it so that the two holes lie in a plane parallel to the face, or so that the second hole is in front of the missed hole. Many accidents have occurred from striking unexploded dynamite in debris from a blast.

With holes that have been sprung, it is not practicable nor safe to drill another hole close to them to blast out the charge.

g. Removal of stemming. There are many ways to remove stemming from a bore hole. The safest and most practicable method is that of blowing the stemming out with compressed air. There is danger, however, of striking the explosive with the metal pipe and exploding the charge. The danger is somewhat lessened, but not eliminated, by having the blow pipe tipped with copper or brass. A safer method of using compressed air is to attach to the air line a stiff rubber hose with a valve for regulating the flow of air and push this hose into the bore hole.

807. Destroying Old Dynamite and Caps

Old deteriorated dynamite becomes very dark brown, sometimes almost black, in color; gets soft and mushy; and the cases are frequently discolored by dark brown stains due to leaking of the cartridges. Dynamite in this condition should be handled carefully, especially if it is leaking. In some instances deteriorated dynamite will fail to explode, causing misfires, and in other cases it will burn instead of detonating, giving off poisonous fumes.

Such dynamite should be destroyed after taking it to a safe distance from any house, railroad, highway, or place where people assemble. Open the cases very carefully, using only a wooden wedge and wooden mallet, take the cartridges out, slit them, and spread them over the ground instead of piling them up. If the dynamite is too wet to burn readily, a little kerosene may be poured over it—*never gasoline*. A small pile of paper, shavings, or other combustible material should be placed close so that the flame will burn along the paper and ignite the dynamite. After lighting the paper, all persons should retire immediately to a safe distance until the dynamite is completely burned. The cases should be piled and burned separately. Not more than 50 pounds of dynamite should be burned at one time. When more than that amount must be destroyed, a new space should be selected for each lot, for it is not safe to place dynamite on the hot ground of the preceding burning. As soon as all the dynamite has been burned, the ground where the material was destroyed should be plowed to prevent animals from eating the poisonous ingredients.

Blasting caps which have deteriorated so that they are unfit for use should be destroyed by exploding. It is not safe to throw them into streams or wells or to bury them, as they may later be discovered and cause serious accidents.

The safest method of destroying caps is to bury them, not more than 100 at a time, under 2 or 3 feet of earth and explode them with an electric exploder. For greater assurance, the electric cap may be placed in a cartridge of dynamite and put in the hole with the caps and shot.

(*To be continued*)

War Department Specifications for Runway Curing Compounds

After further investigation The War Department has clarified its specifications governing the selection of membranous curing compounds for concrete runway construction. Specifications in force during the latter part of 1942 mentioned certain commercial types as having met War Department tests, saying that "in the event that any compound not named above is proposed for use, it will be tested by the government . . ." This clause was subsequently reworded, without entirely clearing up misunderstanding as to tests involved and the basis for acceptance.

Then in February the Chief of Engineers pointed attention to the fact that no material is "approved" as to brand. The present specifications completely delete all brand reference, saying, "A compound will be approved if, in the opinion of the contracting-officer, the laboratory tests and field performance demonstrate that the above characteristics are equal to those secured with satisfactory samples of commercial curing compound submitted for tests at Central Concrete Laboratory, Mount Vernon, New York, in June, 1942.

Tire Conservation by California Highway Department

Measures adopted by the State Highway Division of California have resulted in a saving of 2,641,912 vehicle miles from May to December, 1942. The Department's passenger car mileage during that period dropped from 7,974,360 in 1941, to 5,332,448 in 1942.

Procedure for Deliveries of Controlled Materials for Construction

To clarify the situation with respect to deliveries of controlled materials for construction projects and plant facilities pending the issuance of a formal regulation under the Controlled Materials Plan, the War Production Board made public a Notice explaining the procedures to be followed.

In general, authorization to obtain controlled materials for construction and facilities will be handled by the various claimant agencies to whose jurisdiction the projects have been assigned. Contractors handling the projects have already been notified of these assignments to claimant agencies. The text of the Notice, which was formally issued March 22, is as follows:

War Production Board
Director General for Operations
Notice Regarding Proposed CMP Regulation No. 6—Construction and Facilities

The issuance of proposed CMP Regulation No. 6 covering procedures for obtaining controlled materials for construction and facilities under the Controlled Materials Plan has been postponed pending a revision of processing procedures and standardization of forms.

All current construction jobs authorized in accordance with the War Production Board orders prior to February 17, 1943, have been assigned to individual Claimant Agencies. The Claimant Agencies consist of the following: War Department, Navy Department, Maritime Commission, Aircraft Resources Control Office, Office of Lend-Lease Administration, Board of Economic Warfare, Office of Civilian Supply Department of Agriculture, Office of Defense Transportation, Office of Rubber Director, Facilities Bureau of the War Production Board, Petroleum Administration for War, National Housing Agency and Office of War Utilities Director.

Claimant Agencies have contacted jobs under their jurisdiction, requesting applications for controlled materials. The following forms are being used: Form CMP-OCE No. 1—War Department; CMP-14, CMP-15 and CMP-4C—Office of Civilian Supply; Forms CMP-16, CMP-17 and CMP-4C—Facilities Bureau; and Form CMP-4-C—All other Claimant Agencies.

In the case of construction projects authorized subsequent to February 17, 1943, instructions will be issued to the consumers involved indicating the Claimant Agency to which applications for controlled materials are to be directed and the specific application forms to be used. Applications for authorization to construct will, until further notice, be made in accordance with existing procedures.

All of the provisions of CMP Regulation No. 1 are applicable to construction operations with the following exceptions. None of the provisions of such regulation respecting the authorization of or compliance with production schedules applies to construction and the provisions of paragraph (s-1), restricting the placement of authorized controlled material orders to specified quantities, do not apply to construction. Preference ratings assigned to construction projects may be applied or extended only for the purpose of acquiring those items of materials specifically approved in connection with the issuance of the authorization to construct. Numbers identifying allotments for construction may be used along with such preference ratings in the same manner as provided in CMP Regulation No. 3 governing preference ratings assigned to production schedules.

▼

From the Editor's Field Book

S. D. Harrison, of H. L. Harrison & Son, Inc., general contractors, and his

bridge foreman, B. F. Robinson, posed for their picture on their road job near Newark, New Jersey. This is a relatively short but vital project, the Port Street access road and bridge from Newark Airport to Port Newark, N. J. It consists of a 5-span "overhead" and approaches leading over 15 Central of N. J. and Pennsylvania tracks near the airport. Contract was let February 26 to Harrison for $221,868.

The job involves extensive removal of swampy top soil; 64,000 cu. yd. of back-fill with 7-mile haul (Wm. M. Young Co., sub-contractor); 24-ft. bituminous concrete pavement with tar base (Marsellis-Warner Corp., Montclair, N. J., subcontractor); 3,000 lin. ft. of 18 and 24-in. concrete pipe sewer; and a bridge structure consisting of 5 steel I-beam spans with timber trestle approaches and a concrete deck. The 3½-ft.-thick, 26-ft.-high x 32½-ft.-wide concrete piers are unreinforced except for light bars over footing piles and dowels in the footings. The project is under C. A. Burns, N. J. district highway engineer, with R. E. Beck and A. E. Lee resident engineers.

▼

Westinghouse Has Development Work Under Way on New Control Systems

The accumulated experience of Westinghouse Air Brake Company in the development and manufacture of pneumatic controls for the railroads of the world now is to be made available to the general industrial field, it is announced by George A. Blackmore, president. The company's remote control systems already have been installed in the marine field for the control of ships. Similar applications have been made on power shovels in the earth moving industry, and to help solve control problems in the mining, petroleum and machine tool industries. Among other industries being studied under the broadened industrial program of Westinghouse Air Brake are those requiring accurate, flexible controls involving a sequence of operations, such as agricultural machinery, armament equipment, automotive, aviation, building construction, ceramic, lumbering, metal working, paper manufacturing and plastic. Development work on the new remote pneumatic control systems, supplemented when necessary by the adaptation of pneumatic-hydraulic and pneumatic-electric controls, is being done by the engineering staff of the company at Wilmerding. The new systems will be marketed by the company's industrial division.

▼

Highway and Bridge Tolls Exempted by OPA

Fees charged by toll bridges and toll highways have been exempted from control by the Office of Price Administration in amendment No. 14 to regulation No. 11 to the general maximum price regulation, effective March 15.

AIR-POWER NORTH TO TOKIO...

Ask them along the road to Fairbanks what Blue Brutes can do. The builders wanted rock-blasting air-power they could count on for the toughest construction job since Panama. They took Worthington Blue Brute Compressors and Air Tools — in "uniforms" of olive drab.‡

Over 1200 miles of boggy marshland, swamp-traps, axle-busting mountain peaks, through mud and ice, they helped blast the Alcan highway through. Alaska's, Tokio's fate hangs by that road-thread. Blue Brutes stood action's test.

Worthington Blue Brute Compressors . . . portable and semi-portable . . . gasoline, diesel and electric driven . . . have staying power in a pinch because like road-trained champion heavy-weights they're gentle-breathing. The improved Feather* Valve stops gulping "back talk", when lesser breeds whine for the tool shed. ***They deliver more air,*** steadily, per power-dollar.

Smooth, easy-handling strength makes Worthington Rock Drills and Air Tools also your best "brutes" for fast, historic construction. Sturdy, quality-strong, ***they use less air.*** Your test will prove it.

‡Blue Brute Compressors and Air Tools are painted olive drab for the Army. *Reg. U. S. Pat. Off.

Behind the Fighting Fronts with

BLUE BRUTES

A famous West Coast shipbuilder, who recently broke all records building Liberty Ships, buys Blue Brutes to provide air-power for a multitude of operations, 24 hours a day. Blue Brutes are performing like this in hundreds of Army camps, Navy yards, air bases and ordnance plants throughout the country. Your nearest distributor is listed on page 69.

Get more WORTH from air with WORTHINGTON

BUY BLUE BRUTES

Compressors from 60 to 500 cu. ft. capacity in mountings to suit all jobs. Rock Drills and Air Tools that have always set the pace for easy-operation — available in a wide range of weights and sizes.

WORTHINGTON

Worthington Pump and Machinery Corporation, Harrison, N. J. Holyoke Compressor and Air Tool Department, Holyoke, Massachusetts

Here Is Your Nearest Worthington Distributor

For Sales, Rentals and Service on BLUE BRUTE Portable Compressors, Rock Drills and Air Tools. Get your EQUIPMENT-SAVER — FREE

see full page ad page 68

ALABAMA
Birmingham—Tractor & Equipment Co.
ARIZONA
Phoenix — Smith Booth Usher Company
ARKANSAS—Fort Smith — R. A. Young & Son
Little Rock — R. A. Young & Son
CALIFORNIA
Los Angeles — Smith Booth Usher Company
San Francisco—Edward F. Hale Company
COLORADO
Boulder — Standard Machine Works
CONNECTICUT
Hartford — The Holmes-Talcott Company
GEORGIA
Atlanta — Tractor & Machinery Co., Inc.
ILLINOIS — Chicago — Kennedy-Cochran Co.
Rock Island — Western Equipment & Supply Co.
INDIANA
Indianapolis — Reid-Holcomb Company
IOWA — Des Moines — Electrical Eng. & Constr. Co.
KENTUCKY — Harlan — Hall Equipment Sales
Louisville — Williams Tractor Company
LOUISIANA
New Orleans — Wm. F. Surgi Equipment Company
MAINE — Ellsworth — Murray Machinery Co.
MARYLAND
Baltimore — D. C. Elphinstone, Inc.
MASSACHUSETTS
Boston — P. I. Perkins Company
Cambridge — W. W. Field & Son, Inc.
Springfield — The Holmes-Talcott Company
MICHIGAN
Detroit — W. H. Anderson Company, Inc.
MINNESOTA
Hibbing—Arrowhead Equipment & Supply Co.
Minneapolis — The George T. Ryan Company
MISSOURI
Kansas City — Machinery & Supplies Company
MONTANA — Helena — Caird Engineering Works
NEW HAMPSHIRE
West Lebanon—P. I. Perkins Company
NEW JERSEY
Irvington — Smith Tractor & Equip. Co., Inc.
NEW MEXICO
Albuquerque — The Harry Cornelius Company
NEW YORK
Albany — Larkin Equipment Company
Albany—T. Southworth Tractor & Machy. Co., Inc., Menands
Binghamton — MacDougall Equipment Co.
Buffalo — Dow & Company, Inc.
Corona, L. I. — The Jaeger-Lembo Machine Corp.
Middleton — S. T. Randall, Inc.
New York—Hubbard & Floyd, Inc.
Olean — Freeborn Equipment Company
Oneonta — L. P. Butts, Inc.
Syracuse — Harrod Equipment Company
NORTH CAROLINA
Durham — Constructors Supply Company, Inc.
OHIO — Cincinnati — The Finn Equipment Company
Cleveland — Gibson-Stewart Company
Marietta — Northwest Supply & Equipment Co.
Toledo — M. W. Kilcorse & Company
OKLAHOMA
Oklahoma City — Townsco Equipment Co.
OREGON
Portland — Andrews Equipment Service
PENNSYLVANIA
Easton — Sears & Bowers
Harrisburg — N. A. Coulter
Oil City — Freeborn Equipment Company
Philadelphia — Metalweld, Inc.
Pittsburgh — John McC. Latimer Company
Wilkes-Barre — Ensminger & Company
SOUTH CAROLINA
Columbia — Bell-Lott Road Machinery Co.
SOUTH DAKOTA
Sioux Falls — Empire Equipment Co.
TENNESSEE
Chattanooga — James Supply Company
Knoxville—Wilson-Weesner-Wilkinson Co.
Memphis — Tri-State Equipment Company
TEXAS — Dallas — Shaw Equipment Company
Houston — McCall Tractor & Equipment Co.
San Antonio — Patten Machinery Company
VIRGINIA
Richmond — Highway Machinery & Supply Co.
WASHINGTON
Seattle — Star Machinery Company
Spokane—Andrews Equipment Service
WEST VIRGINIA
Fairmont — Interstate Engineers & Constructors
WISCONSIN
Eau Claire — Bradford Machinery Company
Green Bay — Nelson Machinery Company
Madison — Western Equipment Company
WYOMING
Cheyenne — Wilson Equipment & Supply Co.

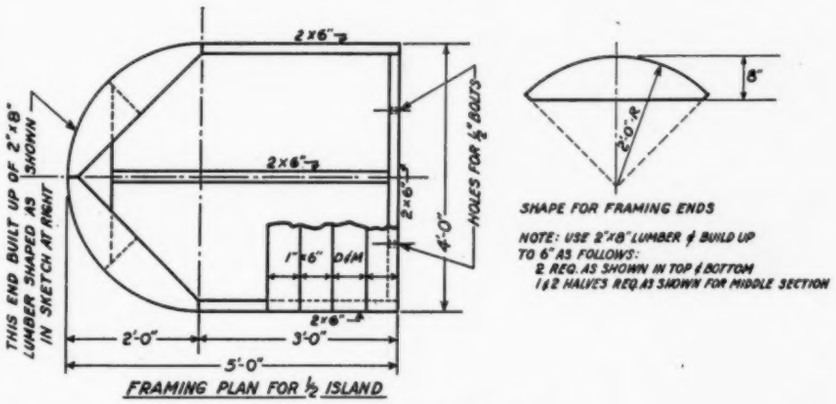
Get more WORTH from air with WORTHINGTON

BUY BLUE BRUTES

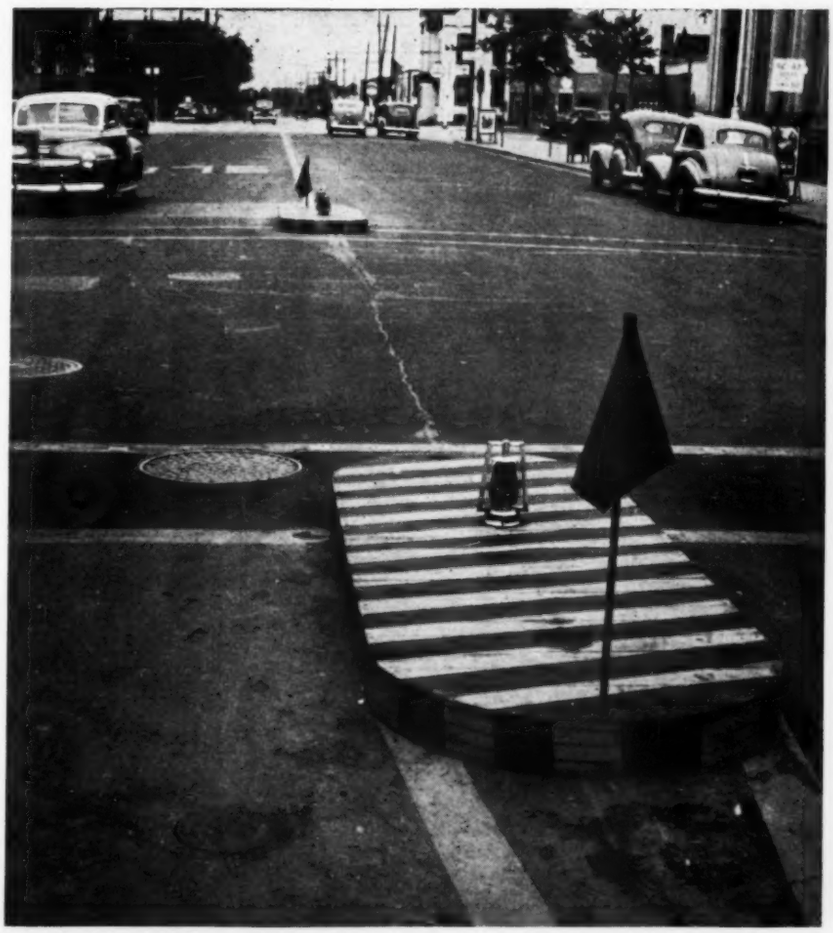
Worthington Pump and Machinery Corp.

"Duration" Safety Island

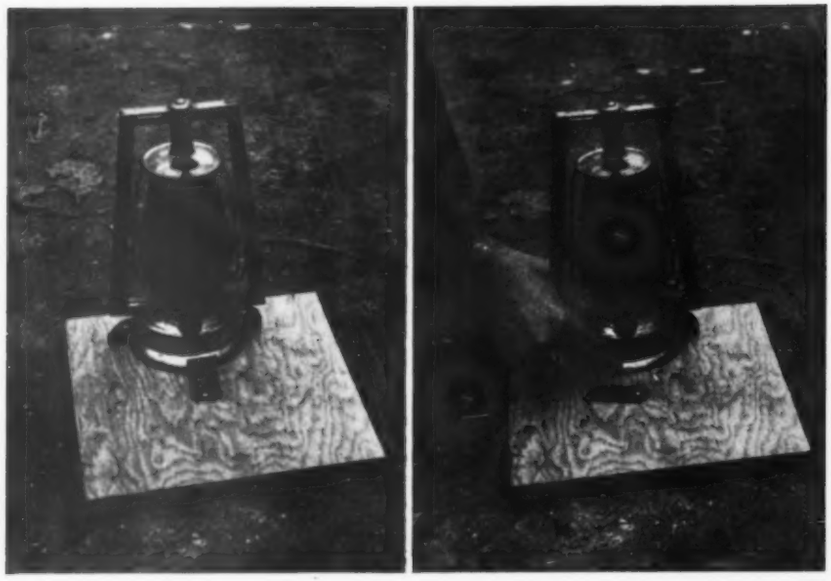
Perhaps the most interesting of the war emergency measures adopted by Kenosha, Wisconsin, is the erection of kerosene-lighted, wooden safety islands at three arterial intersections. The city had planned for some time to channelize Sheridan Road traffic at 57th, 58th and 59th Streets, adjoining the shopping district downtown, where several fatal accidents had occurred and left-turn traffic control was needed. But standard safety-island lights, flasher equipment and cable were not readily obtainable,



Framing plan for island



When electric cable for new lighted safetyislands could not be assured of ready delivery, Kenosha's engineering staff riggedup wooden islands with construction lanterns They do everything but flash



Left: Safety island lantern, with permanent brackets (hand made). Right: With movable brackets substituted, as shown, lamps can be taken indoors readily for lighting or extinguishing during winter storms

or could the alternate step of putting stop lights at the curb be adopted for the same reason.

The answer was to build temporary wooden islands, which served the double purpose of keeping traffic in place and providing a base for temporary lamps consisting of construction lanterns. The islands, made of 1-inch lumber and painted with yellow and black stripes for visibility, are each anchored into wood plugs in the asphalt by means of two 10-inch lag screws. Six islands were installed at the three intersections.

The lamps are anchored to the platform with shop - made metal brackets. During the summer the lamps are permanently held down, and lighted and extinguished in place. Alternate movable brackets are to be substituted in winter, so that the lamps can be taken indoors and lighted during snow storms.

This work was done under the direction of Robert M. Smith, City Engineer of Kenosha.

▼

Shop-Made 4500-Gallon Sprinkler

From the Geo. M. Brewster & Co., Inc. shop at Bogota, New Jersey recently emerged this huge waterwagon to end all waterwagons. Designed and built to Brewster's own ideas, it is intended for use as a super-dust layer on big earth moving jobs, where dust is often a serious problem in hauling and equipment maintenance.

The unit embodies a Euclid trailer and Euclid rear wheels. The frame and tank were built to Brewster design in the local shop of Brokol Mfg. Co., Newark. Its equipment includes a salvaged Carter priming pump mounted on the rear end, for priming the centrifugal pump, a Continental 15-h.p. motor, and an adjustable nozzle. It throws water 100 ft. on either side.

▼

New England States Build Their Own Sodium Chloride Spreaders

Recently the New Hampshire Highway Department developed a home-made sodium chloride spreader attachment for use with small maintenance trucks. These served so well that the Massachusetts department of public works has made several similar units from the same plan details.

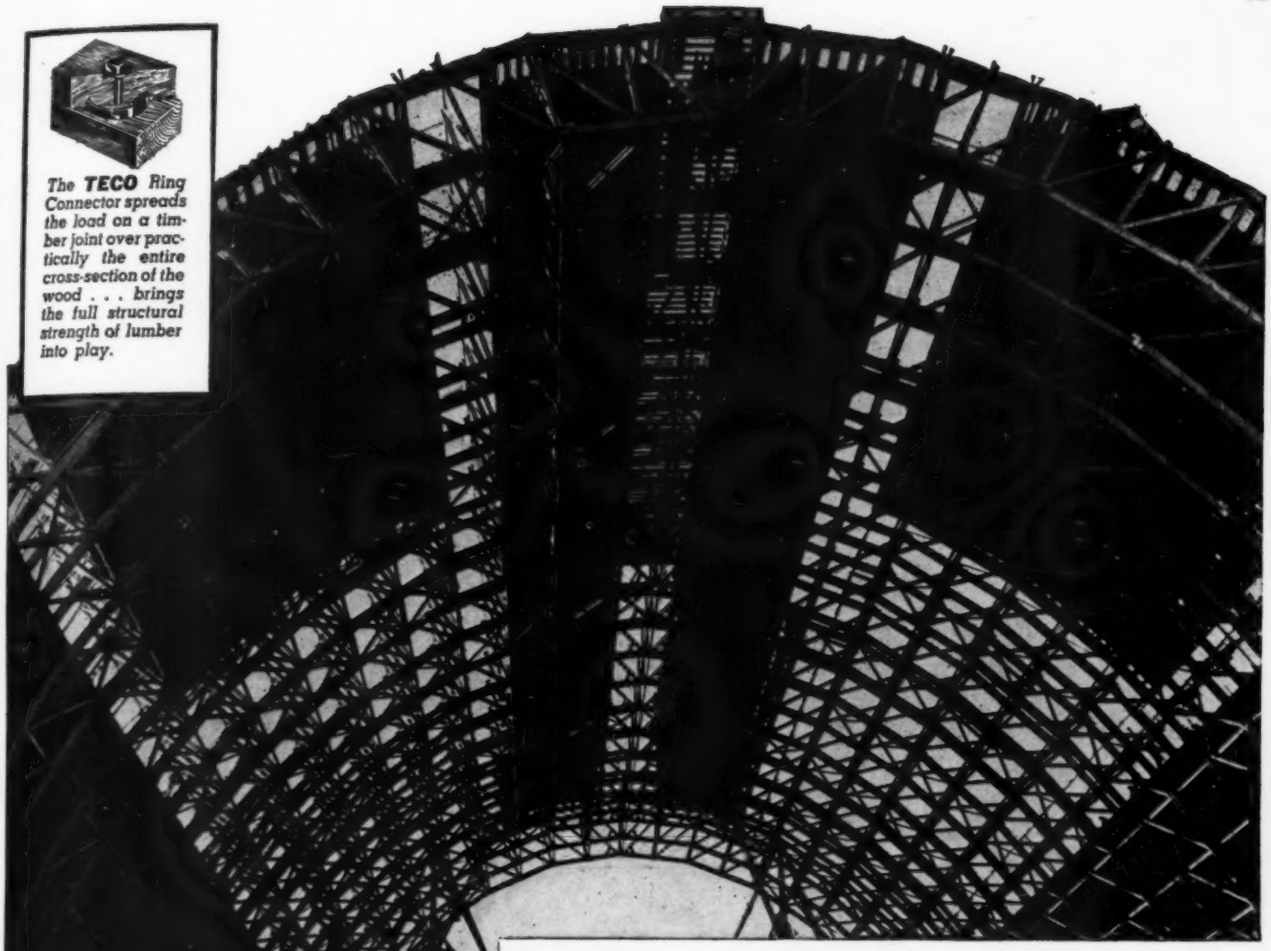
Two units just fabricated in the state's maintenance shop at Boston are freshly painted as shown in the accompanying photo.

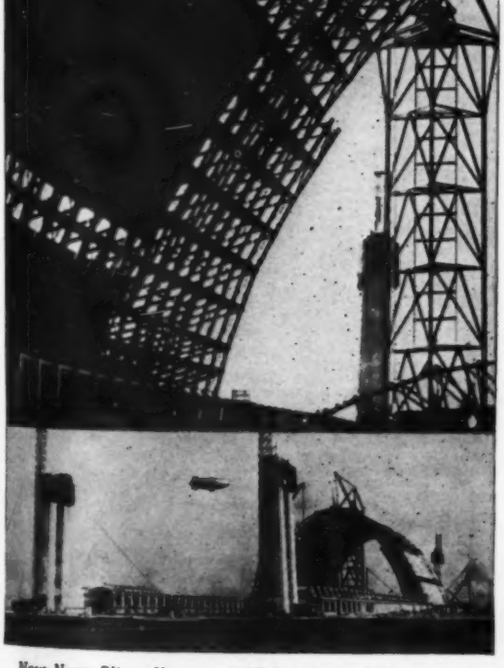
The speaders, which are designed to fan sodium chloride out uniformly from the highway centerline, consist of a 21-in. diam. hopper which holds the contents of one sodium chloride bag, a ⅝-in. feeder pipe, and a spreader plate as shown. The home-made units supplement regular factory-made spreaders obtained before the present scarcity, and are designed to give a lighter spread than usually provided. One fourth to ½ lb. per sq. yd. of sodium chloride is spread on the road surface, at ordinary truck speed.

Other highway or street departments unable to purchase factory-made spreaders can obtain a blueprint of fabricating details by writing J. E. Lawrence, Maintenance Engineer, Massachusetts Department of Public Works, 100 Nashua Street, Boston, or Leroy F. Johnson, Maintenance Engineer, New Hampshire Highway Dept., Concord, N. H.

Big dust-layer for hauling-roads on earth moving jobs sprinkles 100 ft. on either side

The **TECO** *Ring Connector spreads the load on a timber joint over practically the entire cross-section of the wood . . . brings the full structural strength of lumber into play.*





New Navy Blimp Hangar, 1000 feet long; 153 feet high; clear-span roof 237 feet. Timber treated for fire resistance according to Federal specifications. Trusses prefabricated by Timber Structures, Inc., Portland, Oregon.

OUR NAVY BUILDS WORLD'S GREATEST TIMBER STRUCTURE

mammoth blimp hangar was made possible by

TECO CONNECTOR ENGINEERING

Two announcements of the widest import to American engineering have just come out of Washington.

The U. S. Navy has announced that a giant blimp hangar, engineered entirely in timber, is nearing completion "somewhere in the continental United States."

The War Production Board has announced that "such a structure could not have been built of wood by ordinary methods without the use of timber connectors . . . The steel ring timber connector, which is used to increase the strength of joints in wood construction, saved more than 400,000 tons of steel for essential war production in 1942." WPB added that 2,050 tons of structural steel will be saved in this hangar alone.

In erecting this vast, multiple-truss assembly, Navy engineers have accomplished a notable achievement in modern timber connector engineering. The hangar is the latest of scores of large Navy, Army, and Maritime Commission projects built with Teco timber connectors under the revolutionary Teco system of timber engineering. It is one of *over 100,000* heavy-duty structures, of *over 600* types, built under the Teco connector system in the past few years. They include clear-span factories, bridges and trestles, towers, tanks, warehouses, docks, shipyards, and many others.

Write today for our FREE Reference Book for engineers and architects showing 45 *"Typical Designs of Timber Structures."*

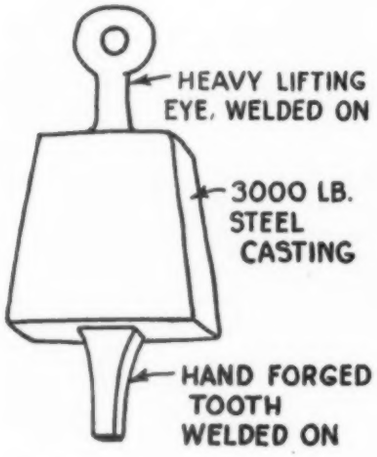
TIMBER ENGINEERING COMPANY

NATIONAL MANUFACTURERS OF **TECO** TIMBER CONNECTORS AND TOOLS

WASHINGTON, D. C. PORTLAND, OREGON

Frost Pin Avoids Jar

How to break frozen ground without jarring surrounding buildings and causing property damage is a common problem in street, alley, basement and other city excavation. And it's one that State Construction Company of Milwaukee has solved very neatly, by rigging up a special frost pin to serve in place of the usual ball-type skull cracker. As shown in the snap-shot and sketch, it consists of a flat-sided piece of steel weighing about 3,000 lbs., to which is welded an ordinary shovel dipper tooth and a lifting eye. Mr. Arthur Stock of this firm, who devised it, says that this neat little gadget, when dropped from a shovel boom, acts as a super "pavement breaker," wedging into and prying apart chunks of frozen ground or even old concrete pavement, with a minimum of vibration. Whereas the force of a dropping ball is vertical, that of a tooth is largely to either side as it wedges in.



When this frost pin comes down—wham! But minus most of the jar common with a ball-type skull cracker. The photo shows it partly buried in the ground alongside a ball used for the same purpose.

"Many efforts have been made to weld a tooth to a ball, with varying success," observed Mr. Stock, "but the hardness of the ball and the difficulty of making a good weld with a spherical surface put two strikes against such attempts."

This pin also has the advantage of speeding the job. The $28 paid a junk dealer for the steel and the small cost of welding are said to have been repaid in a single small winter job.

▼

Roads Chief Gets Navy Commission

R. A. "Alex" Harris, chief engineer of the Mississippi highway department since 1934, has been commissioned lieutenant commander in the navy.

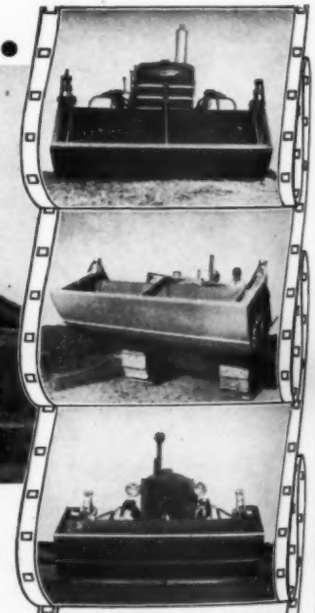
Lieutenant Commander Harris has been connected with the highway department for 23 years and supervised the engineering of Mississippi's $100,000,000 highway construction program from 1936 to 1941.

Officials of the highway department said his post would not be formally filled for the duration but the duties would be divided among other members of the staff.

GOING "GREAT GUNS"...

Drott Bull Clam Shovel

Raises 3' and tilts right or left to 24° angle — from operator's seat.



Fits all late model tractors. Above, on International, Caterpillar and Allis-Chalmers.

Every report on this outfit—from the front lines, service camps, construction men—is summed up with the statement, "It's going 'great guns'!" Rugged, all-purpose . . . it combines the work of a number of units—shovel, scraper, bulldozer, grader—digs, carries or floats material, dumps it...cuts smoothly, spreads evenly. Removes and hauls trees or stumps, big boulders, debris . . . lays pipe, tamps fills — numerous other applications! A variety of sizes—made to fit all late model tractors. Wire, write or call for full information.

- Hydraulically controlled from operator's seat.
- Up to 3' lift above ground—one foot below.
- One to four yards heaped capacity . . . three to twelve thousand pounds lift capacity.
- Raising and lowering of front clam controls cut.
- Regular bucket interchangeable with special snow bucket.

DROTT UNIVERSAL EQUIPMENT

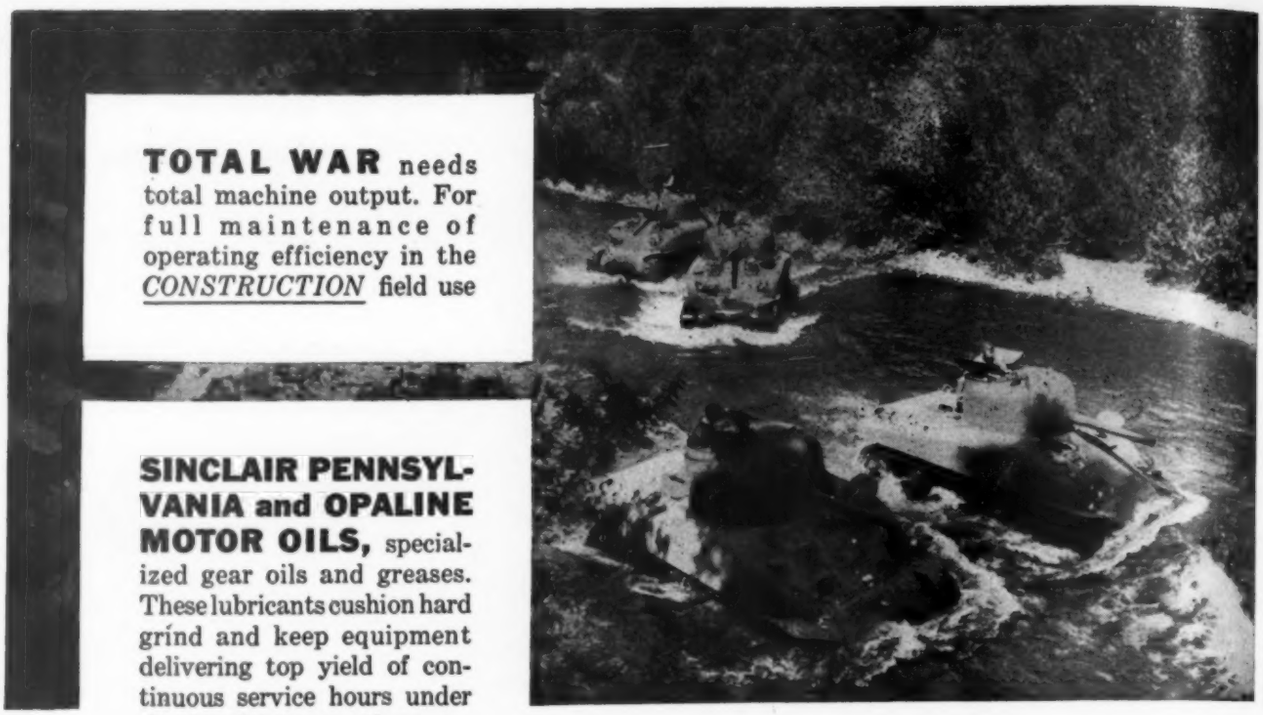
HI-WAY SERVICE CORPORATION

3841 W. WISCONSIN AVE., MILWAUKEE, WIS. • 739 MUNSEY BLDG., WASHINGTON, D. C.

Care and Repair in Shop and Field

CONSTRUCTION EQUIPMENT MAINTENANCE

A SPECIAL SECTION OF ROADS & STREETS



TOTAL WAR needs total machine output. For full maintenance of operating efficiency in the *CONSTRUCTION* field use

SINCLAIR PENNSYLVANIA and OPALINE MOTOR OILS, specialized gear oils and greases. These lubricants cushion hard grind and keep equipment delivering top yield of continuous service hours under the toughest operating conditions.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.

SINCLAIR LUBRICANTS-FUELS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE NEAREST SINCLAIR OFFICE

SINCLAIR REFINING COMPANY (Inc.)

2540 West Cermak Road, Chicago • 10 West 51st Street, New York City • Rialto Bldg., Kansas City • 573 West Peachtree Street, Atlanta • Fair Building, Ft. Worth

Equipment Maintenance

Equipment Maintenance in Massachusetts

From information furnished by

J. E. LAWRENCE

Maintenance Engineer, Massachusetts Department of Public Works, Boston

HOW well we can maintain our 2,000 miles of Massachusetts state highways through the war hinges largely on our ability to nurse our equipment along. The state has about 1,300 pieces of road machinery. Our men have taken pride in the upkeep of these units, and our peacetime routine has paid well in the form of low operating and depreciation costs. The following paragraphs describe some of the normal procedure as well as special wartime steps in preventive maintenance, salvage and repair.

State highway maintenance is conducted under seven districts, each in charge of a district maintenance engineer who is responsible for the care of equipment assigned to his district. The different type of units of course have different needs, but in general the upkeep job is divided into two main types—light trucks and surface maintenance equipment, and the fleet of 4-wheel-drive snow removal trucks, also used for other heavy duty work.

Repair work on 1½ ton trucks and passenger vehicles in general is done by local authorized commercial garages, as our experience shows this to be the most economical method. Even the smallest repair work, except in emergency, is done only after inspection and approval by a district supervisor. Major repairs must be O.K.'d by our mechanical engineer.

Snow Truck Procedure

Our big departmental upkeep job centers around our fleet of 136 four-wheel-drive snowplow trucks (2½ to 10-ton). This equipment is overhauled every summer in the headquarters garage at Boston, by mechanics especially trained to handle our several makes and sizes.

In the Massachusetts shop, when a truck transmission or rear-end goes bad out on the road, a replacement assembly is dispatched to the scene and the truck is soon on its way. This view shows a rear drive assembly being overhauled for this use.

Snow trucks are assigned to the district in November, and during the winter all repairs are done in the districts. During the plowing season mechanics are spotted in various sections of the state, and when a truck breaks down it is usually only a matter of minutes, or at most part of a day, before it is at work again. If the trouble involves a transmission, front-drive, rear end or other assembly, no attempt is made to repair the assembly in the field. Instead a replacement assembly is ordered out from the Boston shop, where a number of such units fitting the various trucks are kept on hand. As an example, on the shop floor at this writing sits an overhauled transmission which will fit any one of three truck models. This repeatedly reconditioned unit comprises some new and some old parts, the case being 12 years old. Several other spare assemblies are waiting for spare parts.

Complete overhauled motors are also kept in readiness to drop in place in the field.

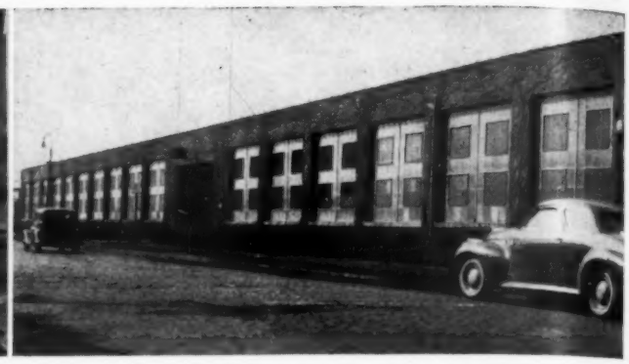
For our field repair work the department has several light-delivery type trucks or "beach wagons" with enclosed bodies. Each truck carries a tool chest, spare batteries, gaskets, hose connections, plugs, fan belts, and sometimes a starting motor for stalled trucks. One truck goes out specially on valve jobs, equipped with a high-speed valve refacing and reseating machine and related tools.

Truck Wheel Repairs

In spite of every precaution, plow operators put a severe strain on truck wheels. Particularly the front wheels have quite a toll of breakage. In ordinary times the cheapest and quickest procedure usually is to discard the damaged wheel for a new one, but today since new wheels are practically unobtainable all wheels short of complete wrecks are salvaged. Trouble starts with the shearing of one or two stud bolts. By the

J. E. Lawrence

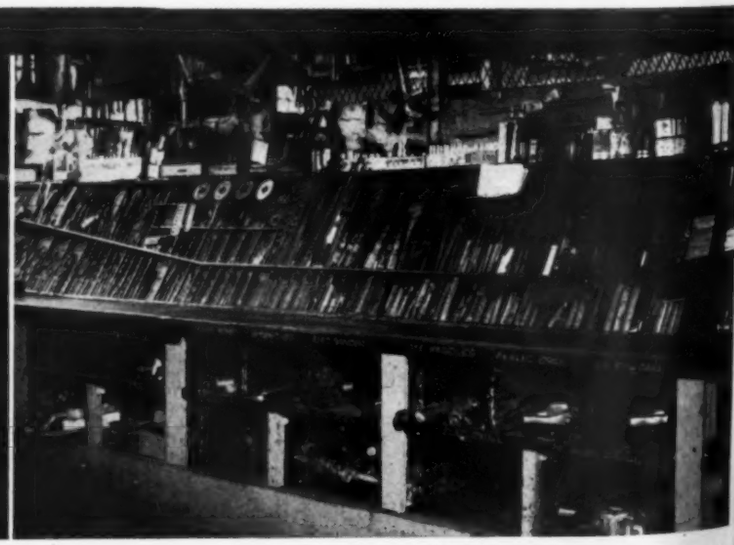
In the center is shop Superintendent Jim Bain, flanked by C. Rizzo, his assistant and R. E. Pyne of the state maintenance staff.



The "hot spot" of the highway department today is the big state headquarters shop in Boston, where the state's 1325 pieces of maintenance equipment are systematically serviced and overhauled.

When disc wheels on the big plow trucks crack—which they often do in heavy service—shop-made replacement discs are kept in readiness to speed repairs (see accompanying article for details).

Another of many replacement units kept on hand to help shorten breakdown delays—a rebuilt transmission assembly which will fit several models of Walter trucks dating back to 1931.



Left: Scores of battery cases have been salvaged. Non-rubber cell plates are ripped out and the cases and caps are held for later rebuilding or for disposal to other agencies. Right: This exceptionally well-laid-out tool rack is a feature of the Massachusetts State shop (only about 1/3 of the long rack is shown here.) Replacement of tools is just beginning to be a problem.

time 3 of the usual 10 bolts are gone the unequal strain soon results in a crack or segment break in the disc.

Our shop men have devised the following procedure for getting wheels quickly back into service, often stronger than new.

1. A flat circular disc comparable to the damaged wheel disc is cut from a piece of ½-in. boiler plate, using an acetylene torch.

2. Small holes are drilled in the disc at the exact location of the wheel bolt holes, using a drill press with a template as a guide (see photograph).

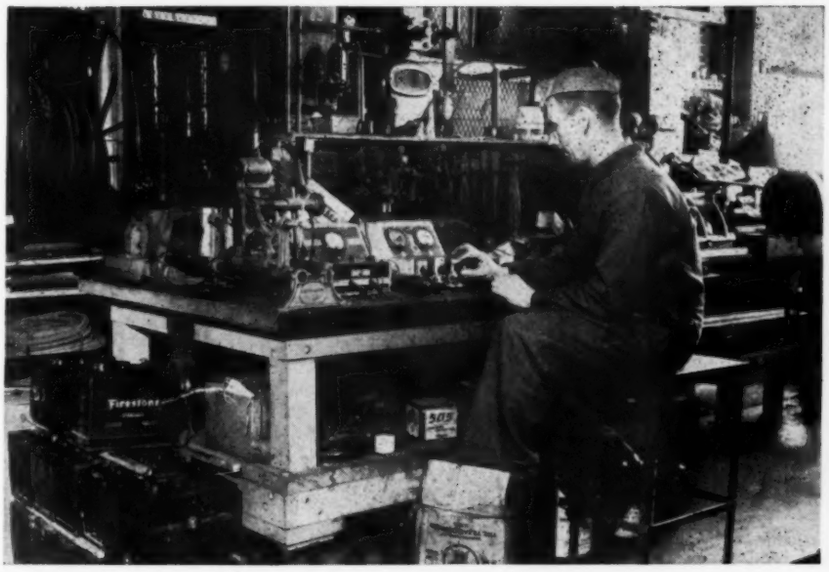
3. The disc is put in a lathe and the center hole cut to conform with the wheel design. The circular, torch-cut perimeter is also smoothed to precise dimension. As now prepared, the new disc is an exact duplicate of the flat part of a typical truck wheel.

4. When a wheel comes in from the field with a crack or break, the edges of the break are "V-ed" out with a hand grinding tool to give a good weld line. A bent or warped wheel is of course straightened in the process.

5. The new disc is placed back on the drill press and the stud holes reamed and countersunk to a diameter matching the holes in the wheel to be repaired.

6. From the disc is then cut a piece of metal that will exactly fit the broken-out area. This piece usually takes in one or more bolt holes. The edges of the piece are "Ve-ed" out and the piece welded in.

The above procedure has several advantages. It is speedy, since only the last three operations are involved after the wheel comes in for repair. It insures a true, well balanced wheel. And it permits repairing almost any size or shape of break. However, it doesn't pay to replace the entire disc area, since the operation would necessitate putting a jig to center the wheel. A steady succession of wheels has been salvaged by the above procedure.



Testing a coil at the electrical bench. Designed and assembled by the shop organization, it includes all equipment needed for testing generators, distributors, magnetos and other electrical units. The other side is a complete home-assembled carburetor bench.

Showing how new snow plow blades are reinforced before putting in service by welding on the remnant of an old blade.

"Snow School" Pays Dividends

Perhaps the biggest factor in the efficient care and operation of snow removal equipment is careful training of operators. Once a year in November our shop superintendent conducts a series of 3-day "snow schools", in the various districts. In other years the school has been designed primarily as a brushing up course for seasoned men. This past year due to the high turnover of workers a great deal of time was devoted to elementary facts.

Small portable working models are used to show the right and wrong way to set the blades and conduct other details of the work.

Of course the routine of greasing and operating machines is taught as thoroughly as possible. A primer-like manual, with simple wiring and other diagrams, is issued to each 4-wheel-drive truck operator, covering the electrical, hydraulic and air systems, running gear, motor, motor-mile tachometer, use of emergency flares, plow hook-ups, lubrication proper use of chains, etc.

Saving Plow Blades

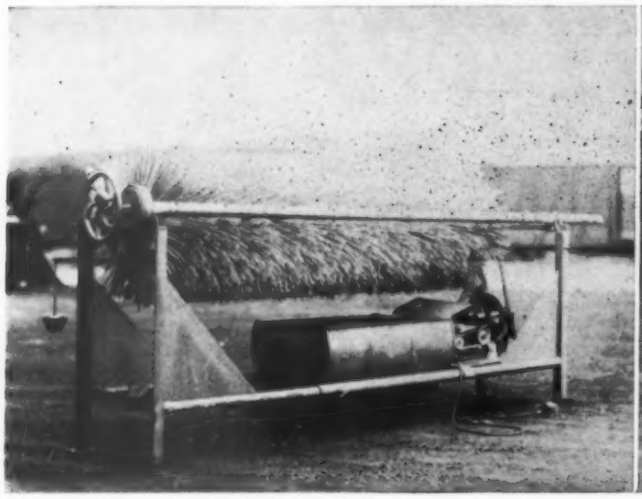
We are doing everything we can to stretch the life of plow blades and thus conserve metal. New one-way blades, a big item with us, are now reinforced before putting in service by welding the remnants of an old worn blade to each new one. This doubles the thickness of the business edge. The blade is spot welded at each end and at four intermediate points.

Every effort has been made to cooperate with the War Production Board's Highway and Transportation Equipment Section on its suggestions for conserving snow blades. Two of their suggestions, namely that cutting edges be saved by not plowing so close to the pavement, and that plows be raised between drifts, have imposed some difficulties. In Massachusetts, heavy traffic plus frequent hills have made it imperative that we blade pavements entirely clear of snow. When a thin layer of snow is left it soon turns to ice. Since motorists and truckers in our state have never taken widely to chains the only safe answer is to blade right down to the pavement.

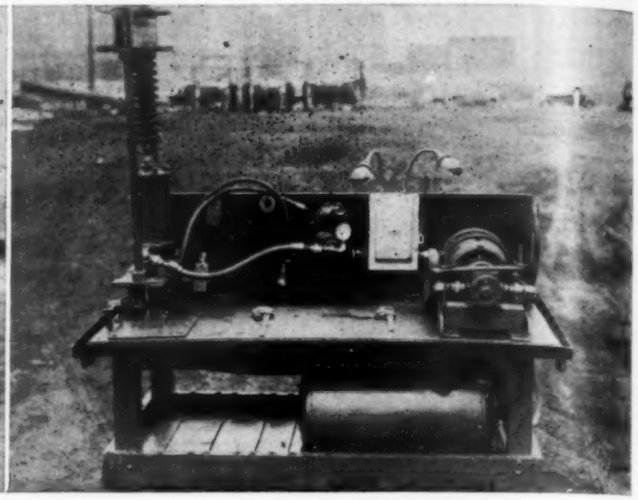
Constant raising and lowering of plow aprons requires such time consuming and machine-wearing effort that it is impracticable to make this adjustment too often. However, our men handled the past winter's unusually heavy snow with less than the normal wear on blades.

Sealing Wet Wiring

Special problems are always cropping up with the snow crews. During the past winter storm, annoying breakdowns were found to be due to wet ignition wires, this condition in turn being traced to the operators practice of wedging up the rear of the



This broom machine was made from old parts and steel items from "here and there." Note tank, from discarded oil drum.



Hydraulic unit test bench designed and built in the Boston shop.

truck hood with a short piece of hose to allow engine heat to strike the windshield. This caused water to run down into the engine compartment, eventually causing motor failure. The trouble was corrected by use of a special sealing compound, which when applied on wet wiring quickly dries and seals the wires so that the vehicle can proceed within ten minutes. All operators now carry this compound, and they have orders to keep the hoods clamped down.

War-Time Care of Tires

Tire inspection and preventive maintenance have been stepped up in recent months. Passenger car tires are the responsibility of the operator; truck tires, of the foreman and operator. A record book which each driver carries is used to report regularly to the district office on tire condition.

Small tires are repaired by commercial garages. Heavy tires are inspected at the central garage with the help of a tire inspection machine and cuts or weak spots are promptly repaired.

A check-up was made recently on the loads actually being carried on our tires. After studying carefully the Federal rulings and recommendations of tire companies, the Department adopted the following truck pay load limits:

Large snow-removal trucks—capacity of body in sand.

1½-ton dump trucks with 600 x 20 tires—4,000 lb.

1½-ton dump trucks with 650 x 20 tires—5,000 lb.

1½-ton dump with 750 x 20 tires—6,000 lb.

Small pick-up trucks—1,000 lb.

The above limits apply to stake and rack trucks as well as dumps. For boom-equipped tree trucks, limit is 3,000 lb. with 32 x 6 eight-ply tires, and 4,000 lb. with 750 x 20 tires.

Drivers are repeatedly urged to use careful judgment with tires. The ration board ruling is that every tire must be run until worn out, meaning until the breaker strip begins to show. No tires are allowed to run with this strip showing, or with a blow-out patch or reliner on the carcass. But a tire that is merely *smooth* may still be good for the full allowable load.

Notes on Headquarters Shop

The Department's main shop in Boston has a long repair bench and "line" for overhauling snow trucks; a compact machine shop with lathe, tool racks, 420-cu. ft. compressor, ignition overhaul and test bench, carburetor bench and miscellaneous equipment; a woodworking room, where prestwood signs and other wood or woodproducts items are made; a modern parts depot; and a hydraulic test bench. The latter is a home-made assembly (see photo), designed to handle all kinds of repair work involving steering rams and other hydraulic units.

Another shop-manufactured item is our broom machine, which has enabled us to recoil street brooms in four hours instead of thirteen days. This was assembled from parts made from stock metal.

Seventeen different types of mowing machines are overhauled in this shop, our practice being to assign a man to one or two types. He goes clear through every machine, inspecting and repairing every part, and sharpening knives and reeels on the shop sharpeners.

This winter a dozen cracked motor blocks were repaired by the Ex-weld cold weld process.

Metal Spray Equipment

After nearly a year for delivery, a metallizing outfit finally has been put to work in our shop. But only a few parts have been metallized to date, this work along with other machine shop work suffering from a shortage of skilled men. A growing stock of worn parts (see photo) is on hand waiting the metal gun.

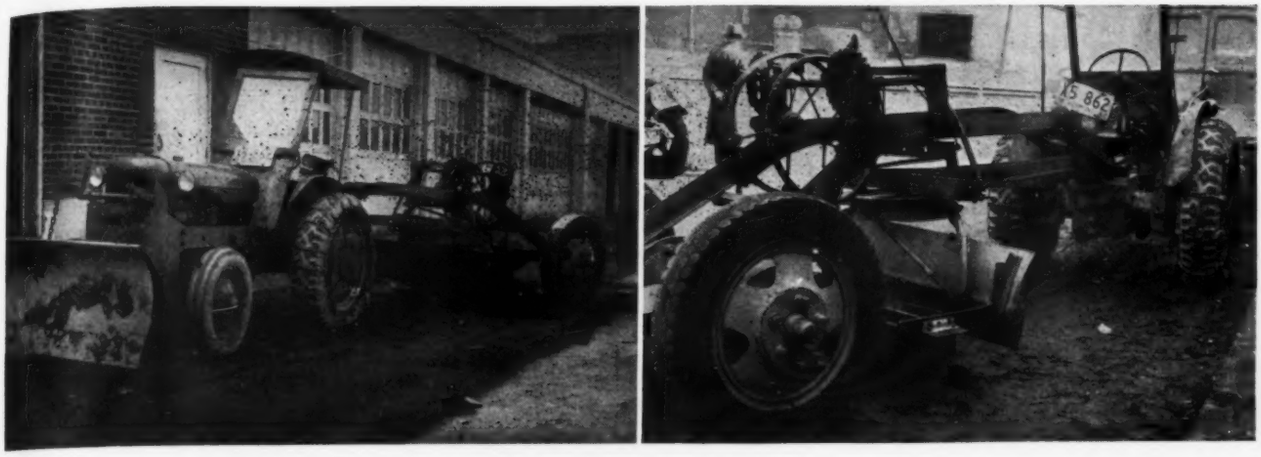
Our shop men are thoroughly salvage conscious. Take rubber belts for loader, for example: The department's fifty loaders are used as sparingly as the labor shortage and the work to be done will permit. And every belt is periodically taken in, inspected, minor defects fixed, and the belt stored in a cool dry place in the stock room until needed again.

Batteries are also salvaged systematically. Call plates of old batteries are ripped out and the rubber cases stored until they can be released to a proper salvage outlet.

Shop Men Gone to Army Unit

I've said little about manpower shortage. We have the problem too. The state highway organization is proud of its men in service, especially so of the Army Ordnance Unit that was formed by department men for heavy equipment duty. In this outfit are several of our key men, including two of our foremen who are now technical sergeants.

Herman A. MacDonald is Commissioner of the Mass. Dept. of Public Works and R. W. Coburn is Chief Engineer. The maintenance activities are under the general direction of J. E. Lawrence, with James Bain, shop supt.



Two views of a sidewalk plow as it is hooked up in spring and summer to an old horse-drawn grader, now equipped with rubber tires and an improvised broom behind the blade.

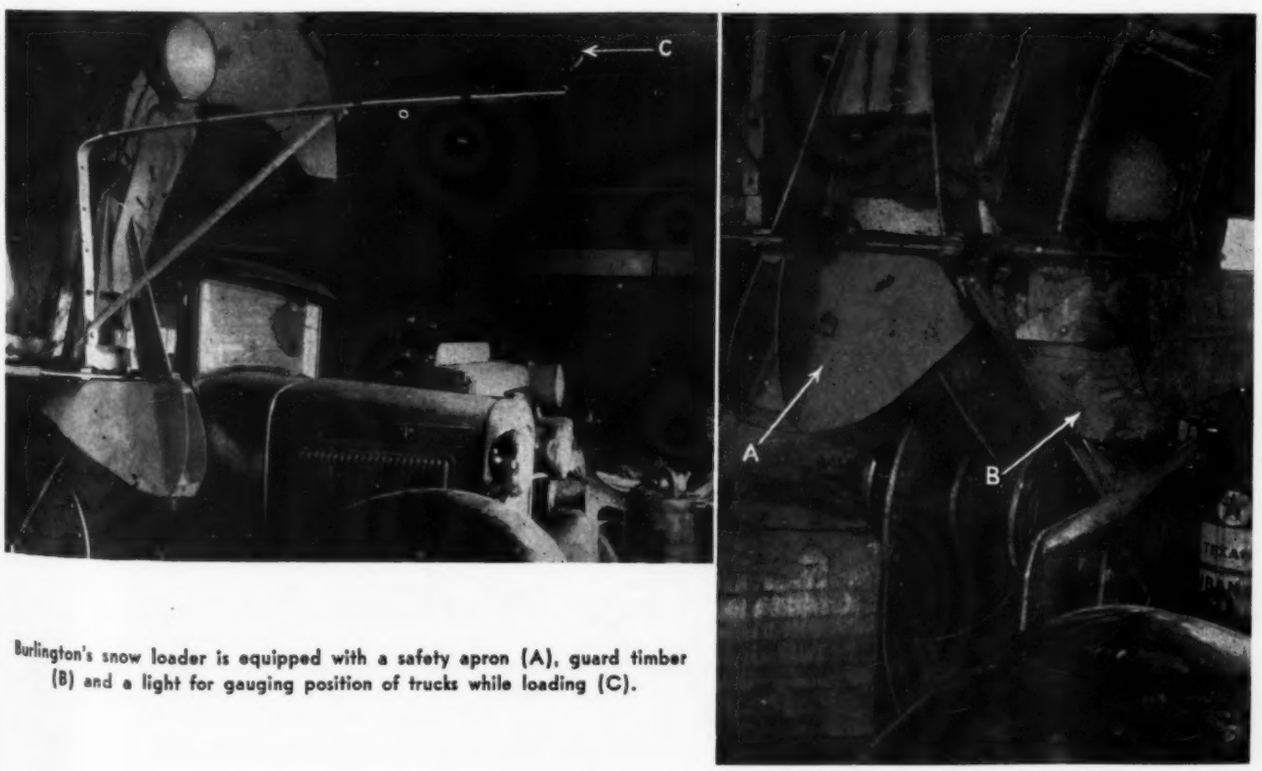
Burlington's Strange "Hybrid" Machines

Only the legendary "one hoss shay" that finally wears out all over at once would escape being salvaged in some manner by the municipal shop men at Burlington, Vermont. City engineer, George C. Stanley, is particularly proud of the old Pierce roller, which now goes kiting along under the power of a Ford Model A, 4-cylinder engine, the old 2-cylinder having worn out long ago. As shown in the photo, the present machine was changed from gear to sprocket drive, in order to utilize sprockets and chain saved from a dismantled Elgin sweeper. The enlarged water tank was made in the shop.

And, industriously at work the year around in Burlington is an outfit consisting of an Allis-Chalmers Model 1-B tractor, with a bulldozer in front and an old horse-drawn Good Roads grader connected into a trailer unit behind. In order to provide mobility, the old iron grader wheels were replaced by the rubber-tired rear wheels of a small truck. The dozer-equipped tractor unit, operating alone, does sidewalk snow plowing and sanding in winter and piles snow for the loader. In the spring the grader is hooked on for cleaning up the streets. The strong blade takes the heavy stuff and dislodges finer material for the street broom. Note the shop-made attachment back of the blade, to which is fastened an improvised drag boom made with Kinney steel broom sections.

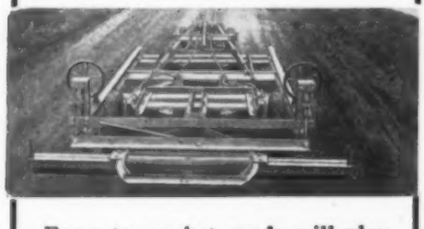
Occasionally Burlington officials have developed useful attachments for their standard factory equipment to fit their special needs. For instance, in using Snow King loader, three features were added (with factory approval) as follows:

One of the elevator bucket castings was bolted on as shown in the accompanying photo, to act as a safety fen-



Burlington's snow loader is equipped with a safety apron (A), guard timber (B) and a light for gauging position of trucks while loading (C).

GOOD ROADS PAY DIVIDENDS



Farm to market roads will play an increasingly important part in the transportation of food products, much of which will be needed to feed our boys at the front. That is why these roads should be kept in first-class condition.

A BURCH maintainer with the tractor you now own will do the work efficiently, economically. See your nearest dealer.

Manufactured by

THE BURCH CORPORATION
Crestline, Ohio

Have you bought Bonds today?

BURCH SINCE 1875.

NEED A BIG Trailer?

La Crosse Makes Them Up To 200 Ton Capacity-

** WRITE OR WIRE **

LA CROSSE TRAILER & EQUIPT. CO.
LA CROSSE WISCONSIN U. S. A.

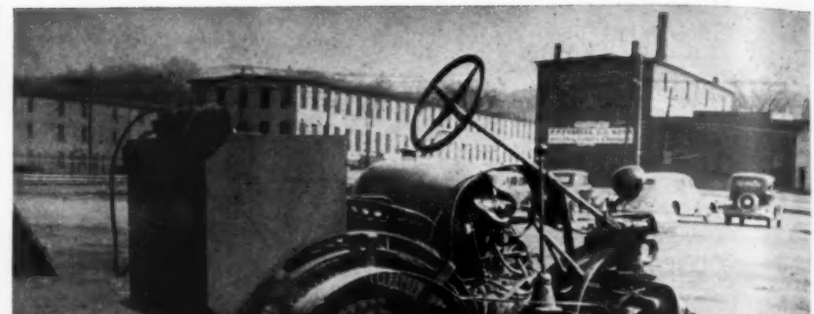
TRANSITS and LEVELS

HEADQUARTERS for REPAIRS – any make

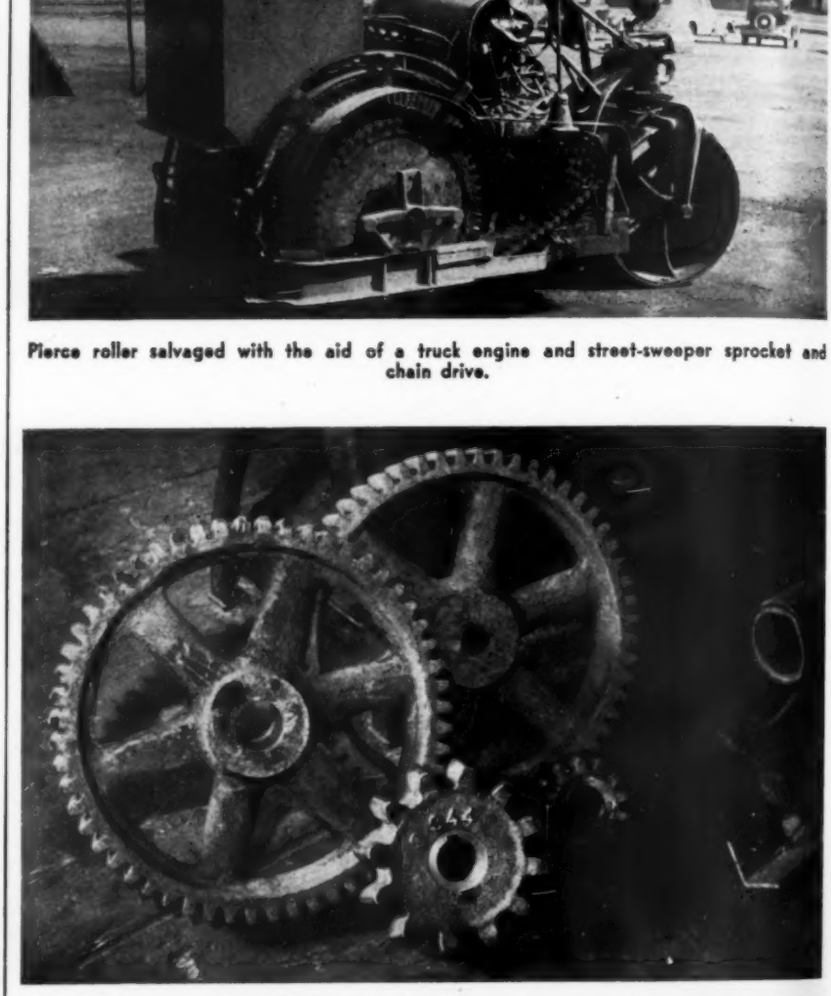
We will buy or trade in old Transits, Levels, Alidades, etc. Send instruments for valuation.

Write for new Catalogue RS 8-4 of Engineering Instruments, Engineering Field Equipment and Drafting Room Supplies.

WARREN-KNIGHT CO.
Mfgrs. of Sterling Transits & Levels
136 N. 12th St. • Philadelphia, Pa.



Pierce roller salvaged with the aid of a truck engine and street-sweeper sprocket and chain drive.



Fighting the parts shortage: The City of Burlington had these drives and pinion gears for its crusher screen made at a local foundry. No machining of teeth was necessary, teeth being merely touched up here and there "by hand." Shaft holes have been reamed and smaller gears fitted with keyways.

der. This detail is considered valuable in down-town street clearance, where spectators edge up close to the loading screw and may be hit by flying pieces of ice.

Heavy timber, armored with sheet metal was added to protect the loader from damage by the rubbing of truck bodies during night operation.

And a small red light attached to a metal arm out over the left fender also aids in night operation by helping the driver spot and hold his truck more accurately while loading. He learns from experience the precise point alongside at which the light should be seen out of the corner of his eye when his truck is squarely under the chute.

Ancient Clamshell Overhauled For Wartime Service

"How old is it?" we asked, on seeing this old bucket.

"We bought it five years ago, second-hand, and have been using it ever since," was all that George C. Stanley, city engineer of Burlington, Vermont, could say. "It's seen hard use, but it's going to begin life over," he went

on to explain. George Pollinger, the city's veteran machinist, and his helpers were working on this ⅝-yd. bucket in the municipal machine shop. It was just one chore in a continuing job of salvage and preservation that has been in progress at Burlington for years but stepped up in recent months.

To begin with, the hinge pin had worn itself down to a half-moon shape under the bearings, at the same time enlarging its bearing holes to the shape of an oversize horse collar, with a couple inches of play where there used to be just a nice tolerance.

The first job was to restore the hinge-pin bearings connection, done as follows: The worn holes (at A) were reamed until a true cylindrical bore was obtained for about three-fourths of the diameter. New bushings were made from short sections of an old crusher roll, turned to proper outside diameter and bored to fit the new hinge pin. The bushings were driven to a tight fit with a sledge, and worn areas filled with salvaged babbitt metal.

Next a new hinge pin (B) was made from a length of cold-rolled steel shafting obtained from a local junkman. In order to utilize this piece it was necessary to fill in an existing keyway, by setting in a piece of steel and tapping it into the shaft with countersunk screws. The shaft was turned down about 1/16 in. to correct diameter on the shop lathe, which machined over the filled keyway and screw-heads in the process.

The sides of the bucket had become sprung outward about 1½ inches during the gradual process of wear in the hinge pin. The bucket assembly was pulled together by knocking out one rivet on either side and inserting and tightening a long threaded bolt (C) through the two hinge plates. The bucket was preheated before drawing to shape. Worn corner pins (D) were replaced with new ones made from old—(*Continued on Page* 82)

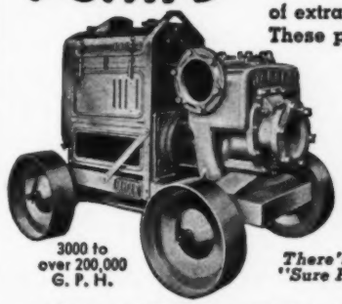
Sizes 1½" to 10"

CERTIFIED HIGH PERFORMANCE

Every Jaeger Pump is Individually Tested and Guaranteed for Vacuum, Capacity and Pressure

THOUSANDS of EXTRA HOURS of SERVICE for Your Future Protection as Well as Profit

Only JAEGER PUMPS


3000 to over 200,000 G. P. H.

offer you factory-tested and certified high performance in units of extra heavy duty construction. These pumps are the surest protection your money can buy against pump breakdowns and job delays, the best insurance the contractor can have against the cost and uncertainty of early replacement.

There's a size and type of Jaeger "Sure Prime" Pump to fit any job. Ask for Catalog.

THE JAEGER MACHINE COMPANY
223 Dublin Ave., Columbus, Ohio

CONTRACTORS' PUMPS, MIXERS, HOISTS, PAVING EQUIPMENT

JAEGER PAVING TEAM

—for Faster Airport Paving (Has Laid Over 275 Ft. per Hour of 25 Ft. Width. Over 475 Ft. per Hour of 10 Ft. Width).

—with Greater Density and Uniformity of Slab Due to Spreader Re-Mixing Screw.

—with Precision Smoothness of Riding Surface.

—with Manpower Saved by One-Man Operation and Cutting Final Finishing Time.

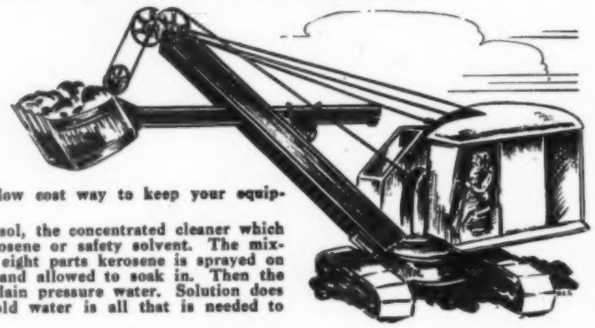
Send for Contractors' Reports and Catalog

THE JAEGER MACHINE CO., 223 Dublin Avenue, Columbus, Ohio

Mixers, Pumps, Hoists, Truck Mixers

Showing bushing in place in the far hinge-pin bearing (A), and new shop-made pin (B) inserted for a preliminary fitting. The black streaks in the pin mark the edges of an old keyway, since filled with metal (see text). The twisted alignment of the two bearings will be corrected in the process of pre-heating and drawing the arms together with turn-bolt inserted through rivet-holes (C).

KEEP EQUIPMENT CLEAN THE MAGNUSOL WAY!



There is a quick, easy, low cost way to keep your equipment clean at all times.

This is the use of Magnusol, the concentrated cleaner which is mixed with low-cost kerosene or safety solvent. The mixture, one part Magnusol to eight parts kerosene is sprayed on the surfaces to be cleaned and allowed to soak in. Then the surfaces are sprayed with plain pressure water. Solution does not need to be heated. Cold water is all that is needed to rinse.

Results? Thoroughly cleaned equipment free from all traces of grease, oil and dirt without scrubbing or brushing. Magnusol takes the "cling" out of grease and oil and reaches the most inaccessible spots on any machine.

★ ★ ★

There are many other Magnus Cleaning Methods and Materials in which you should be interested. For cooling systems of motors and engines . . . for sludge control and sludge prevention in motors . . . for cement floors and driveways . . . for sludge elimination in Bunker C and other heavy fuel oils. Ask us for recommendations on your particular cleaning problems.

Spray on the Magnusol mix. Let soak in. Then wash off with water spray. That's all there is to the Magnusol way.

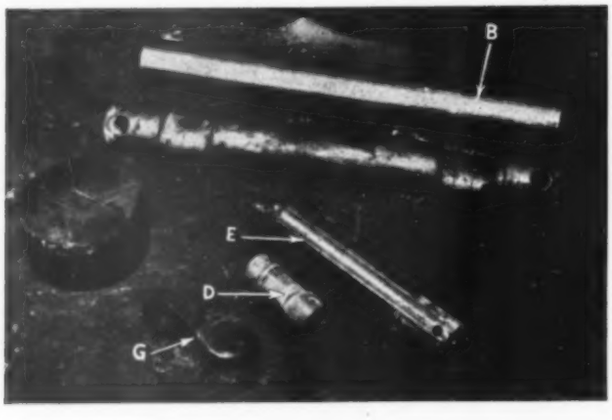
MAGNUS CHEMICAL COMPANY
Manufacturers of Industrial Cleaning Materials
113 SOUTH AVENUE GARWOOD, N. J.
SERVICE REPRESENTATIVES IN ALL PRINCIPAL CITIES

MAGNUS CLEANERS

pieces of old shafting, shown at (E). Bronze bushings from a scrapped machine were ground down to fit here. Pin bearings at (F), while not worn so deeply, again presented somewhat of a problem. As with other reaming jobs, there was no way to set the unit up on the lathe, so reaming to oversize was accomplished as a hand "push and pull" task. The photo shows how the reamer tool was held in place by one man, who also held a turning bar while the other fellow applied elbow grease. This took hours of patient work. New shop-made pins were used here, too.

The worn V-slot between the headrope guide rollers was built up with welding rod and ground with a hand grinder. Worn surfaces of a double-eye yoke (G) also were to be welded and ground.

The clamshell's general-purpose teeth, strangely enough, weren't in need of dental work. They were however removed during the overhaul. The sheaves and other parts likewise were in serviceable condition and needed no immediate repair. Thus, at a fraction of the cost of a new bucket, this old clamshell's joints were tightened up for accurate, efficient operation and its useful life was extended for several years.



The long pieces are the old and new hinge pins. The shorter pins are a typical worm corner pin and piece of scrap shafting used to make two new ones. Shown also is the sawn segment of a crusher roll, to be burned down into a companion bushing to (A), and a worn eye-connection waiting to be welded.

Don't Scrap it - WELD IT

No Waiting! No Delay

Deliveries are no problem when you repair worn parts with MANGANAL WELDING PRODUCTS. MANGANAL will rebuild your buckets, dipper teeth, frogs, crossings, gyratory crushers, jaw crushers.

Repair your broken and worn parts with Manganal—it's the easy, quick and efficient way. Manganal alloy steel welding wedge bars and shapes give new lives to old parts.

MANGANAL

STULZ-SICKLES CO.
NEWARK, N.J.

Burlington machinist, George Pollinger, turning the piece of old shafting to exact size for the new hinge-pin.

Maintenance Data for Wire Rope from John A. Roebling's Sons Co.

1. When installing a new rope, take care to avoid kinks. If rope is on a reel, mount the reel and run rope off slowly straight ahead. If in a coil, run the coil along the ground like a hoop.

2. Check the loads handled by every rope. If load is more than 20% of the breaking strength, install a stronger rope and transfer the present one to duties within its abilities. On some installations it may be necessary to use a working load of even less than 20% of the rope's breaking strength.

3. Check condition of all equipment over which the rope operates. The sheave groves should afford proper clearance and offer full support. This is especially important when new ropes are installed. Check condition of bearings of all sheaves over which rope operates.

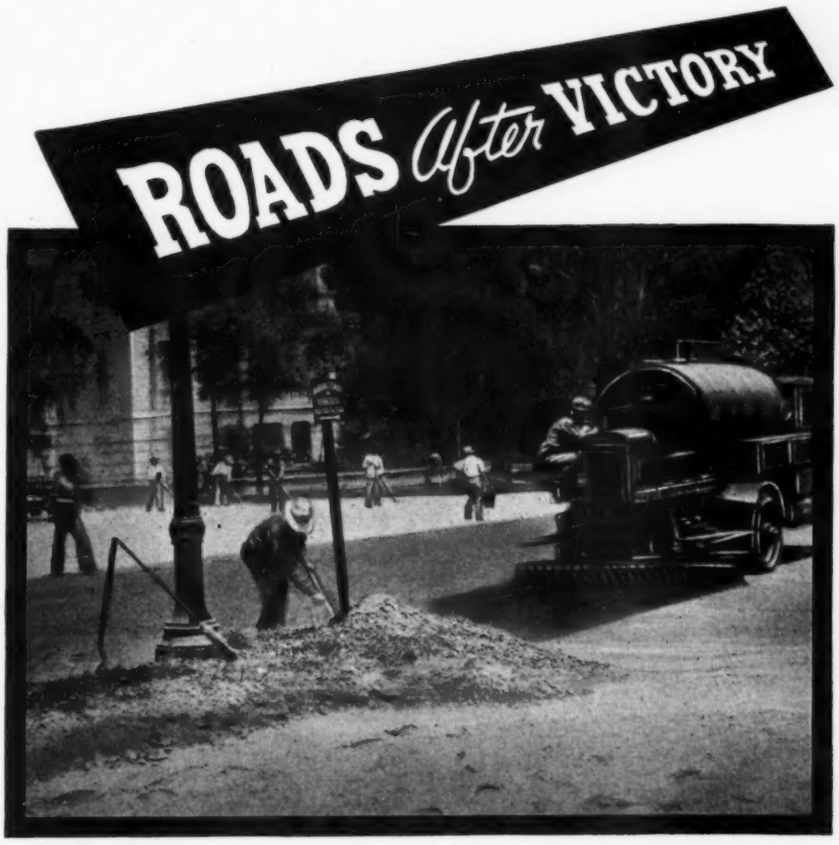
4. Make sure there is no slack and no yanking at start of loads.

5. Watch for corrosion and fatigue signs at clips and sockets, reclip or resocket when they appear.

6. Lubricate regularly, with neutral lubricant of proper viscosity, applied at correct temperature, preferably by running rope through bath of heated lubricant, and wipe off excess carefully.

7. If excessive wear shows in any section, distribute this wear by cutting back from end of rope or by turning rope end for end.

8. Inspect regularly for broken wires, signs of abuse, reduced diameter, corrosion or other damage. Cor-



"Seamless" Bituminous Highways are Quickly Constructed . . . Low in Cost . . . Long-lasting!

Destined to be the arteries of post-war living, new highways and airports are now on drafting boards all over the world! Business men and public executives realize that communities which are first to provide *adequate* facilities for modern travel will reap *larger shares* of accelerated after-war commerce.

Experience records compiled throughout the United States point the way towards "seamless" *bituminous* construction of roads, streets and airport runways . . . free from joints and cracks . . . less vulnerable to ravages of the weather.

Motorists and pilots are delighted with resilient "cushioned" *bituminous* surfaces . . . easier on the rider . . . less wearing on the tires . . . less glaring on the eyes of the driver. And tax payers appreciate the speed of construction . . . the low original cost . . . the decreased maintenance costs . . . the long life of *bituminous* roads. Get complete details in new *free* booklet—write for *your* copy!

ETNYRE
"Black Topper"
BITUMINOUS DISTRIBUTORS

E. D. ETNYRE & CO., MAIN PLANT AND OFFICE, OREGON, ILLINOIS, U. S. A.

Crowning Screeds

On a new pavement finishing machine the screeds are usually set to the proper "crown" or bottom curvature at the factory. It is advisable, however, to check the crown upon arrival at the job as the curvature may have changed due to rough handling, etc. This detail is especially important now that finishers of all makes, vintages and former servitude must often be pressed into service.

The easiest way to check crown in a screed bottom, according to Jaeger Machine Company's new maintenance manual, is to place a block about 12 in. long and 1 in. thick between the screed and the road form at each end of the screed (Fig. 1). Be sure that the levers and connections that lift and lower the screed are free. Stretch piano wires across under the full length of the screed about 1 in. in from the front and rear edges of the screed. Be sure they are very tight. (Fish line will answer if piano wire is not available.)

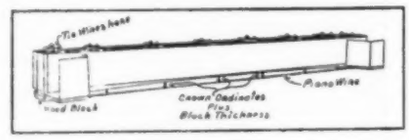


Fig. 1

Crown dimensions are usually spaced at 2 ft. intervals, beginning at the center of the screed, and are measured from the wire to the screed bottom at these points. As there is no fixed standard for screed crowns in relation to width of road, it is usually necessary to get the proper crown measurements for any job from the drawings or the engineer in charge.

EXAMPLE (*See Fig. 2*)
Mid Ordinate at E = Known Height
Ordinate at A = 0

$$\text{Ordinate at B} = \frac{7 \times 1}{4 \times 4} \times E = 7/16 \times E$$

$$\text{Ordinate at C} = \frac{2 \times 6}{4 \times 4} \times E = \tfrac{3}{4} \times E$$

$$\text{Ordinate at D} = \frac{3 \times 5}{4 \times 4} \times E = 15/16 \times E$$

$E = 2''$
$A = 0''$

$$B = \frac{7 \times 1}{4 \times 4} \times 2 = 7/16 \times 2 = \tfrac{7}{8}''$$

$$C = \frac{2 \times 6}{4 \times 4} \times 2 = \tfrac{3}{4} \times 2 = 1\tfrac{1}{2}''$$

$$D = \frac{3 \times 5}{4 \times 4} \times 2 = 15/16 \times 2 = 1\tfrac{7}{8}''$$

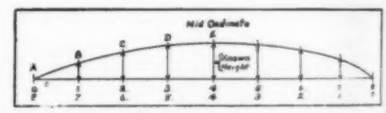


Fig. 2

If crown details are not available, but the height of crown at center is known, the crown ordinates can be found by following short method.

Short Method for Determining Parabolic Crowns

Any number of points may be used although 2 ft. spacing beginning at the center of the screed is usually accurate enough.

To correct or change the crown at any point in the screed bottom, turn the crown adjustment nuts directly over the screed area involved until the correction is made. It may also be necessary to adjust the nuts in order to obtain the correct contour. If a radical change is to be made, do not move one nut for the full amount but make the adjustment gradually by turning all nuts involved a small amount at a time. Do not disturb nuts at either end.

"First Call on Defense Jobs"

WILLIAMS "SUPER-Hi" TENSILE TIE RODS (Elastic Limit or Working Load 4 Times as High as Mild Steel)
INEXPENSIVE U. S. STANDARD THREAD RODS

(Wire or phone *Collect* on orders of $100.00 or more)
Immediate 24-hr. Service
PHONE 3-3823 Day or Night

5/8" diam. (2) U. S. — 16 thd. 9,500 lbs. Ultimate Tensile 7,500 lbs. Working Load per Rod			3/4" Diam. (3) U. S. — 13 thd. 16,500 lbs. Ultimate Tensile 13,000 lbs. Working Load per Rod		
LENGTH of Rod	Price per 100 Rods	App. Wall Width	LENGTH of Rod	Price per 100 Rods	App. Wall Width
12" or less	$3.00*	15" or less	12" or less	$4.00*	15" or less
13"	3.25	16"	13"	4.33	16"
14"	3.50	17"	14"	4.67	17"
15"	3.75	18"	15"	5.00	18"
16"	4.00	19"	16"	5.33	19"
17"	4.25	20"	17"	5.67	20"
18"	4.50	21"	18"	6.00	21"
19"	4.75	22"	19"	6.33	22"
20"	5.00	23"	20"	6.67	23"
21"	5.25	24"	21"	7.00	24"
22"	5.50	25"	22"	7.33	25"
23"	5.75	26"	23"	7.67	26"
24"	6.00	27"	24"	8.00	27"

*Rods under 12" in length knurled to prevent turning in concrete.

● More than a million "Super-Hi" Tensile Tie Rods used in construction of world's largest building at Arlington, Va.

Housing 40,000 workers, the War Department's Pentagon Building is the world's largest office structure. It also is uncommon because of its shops, concentric office rings, and ramps for pedestrian travel from floor to floor.

MEGAFORM-XTRNAL Trade Mark

WILLIAMS FORM ENGINEERING CORP.
Box 925, Madison Square Station GRAND RAPIDS, MICHIGAN

rect all abuses as soon as they appear.

9. Check inspection records covering number of broken wires in worst rope lay by test of discarded ropes, and set up safe practice for removal of ropes from service based on these tests.

New Equipment and Materials

New Floodlight

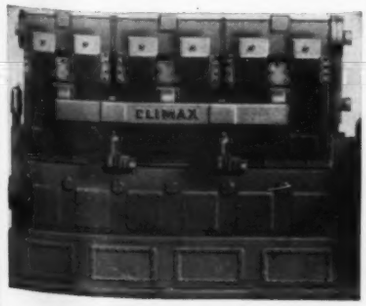
New floodlight, employing standard 200 watt incandenscent, with silver-mirrored glass "Permaflector", for fixed locations or for mounting on power shovels, bulldozers, trucks and cranes, is offered by Pittsburgh Reflector Co., Oliver Bldg., Pittsburgh, Pa. New floodlight is extremely shock-resistant and completely weatherproofed. Permaflector is housed in corrosion-resistant sheet steel housing, with convex, heat-resisting 8⅜ in. cover glass, equipped with removable lens frame and clamp, porcelain socket and weatherproof cord-grip fitting. Floodlight is 12½ in. high overall; weighs 6½ lbs. Adjustable bracket, permitting 250° vertical and 360° horizontal swing.

Permaflector Floodlight — ST-200

New Gas Engine

The new V-12 Blue Streak engine has been added to the line of the Climax Engine Co., Clinton, Ia. With a normal speed range of 600 to 1,200 r.p.m. and a brake horsepower of 435, the new V-12 is stated to meet today's demands for a high speed engine which will mesh with modern power consuming machinery for rock or oil drilling, operating large pumps and compressors, driving mining and construction machinery and, with suitable generators, a low cost means of generating electric power. The Climax new V-12 is available in two bores. Model V-335, 6½" bore and 7" stroke develops 375 hp. at 1,200 r.p.m. Model V-390 with a 7" bore and 7" stroke develops 435 hp. at 1,200 r.p.m.

Dual ignition can be furnished in the following combination: Dual battery ignition, dual magneto ignition, dual battery and magneto ignition.



Climax V-12 Blue Streak Engine

DAY and NIGHT...
NIGHT and DAY
Non-stop service under the pressure of events... the tempo of the Buffalo-Springfield roller in wartime.
The building of fields and runways preparatory to attack... the specialized role of the Buffalo-Springfield roller in the drama of war.
Production now earmarked for delivery to the Armed Forces and Military Contractors and available to contractors after Victory.
THE
BUFFALO-SPRINGFIELD
ROLLER COMPANY
SPRINGFIELD, OHIO

GRUENDLER CRAFTSMANSHIP
Employed by U.S.A. in the WAR EFFORT

For Access Road and Air Base Construction

PORTABLE CRUSHERS

Proper Size Aggregates—on the Job

Balanced, Non-Tipping. Expertly designed to meet your exact requirements in proper size aggregates—larger capacity and quick mobility to and from job.

Four Wheel Maintenance JAW CRUSHER with Power Unit

GRUENDLER ENGINEERS

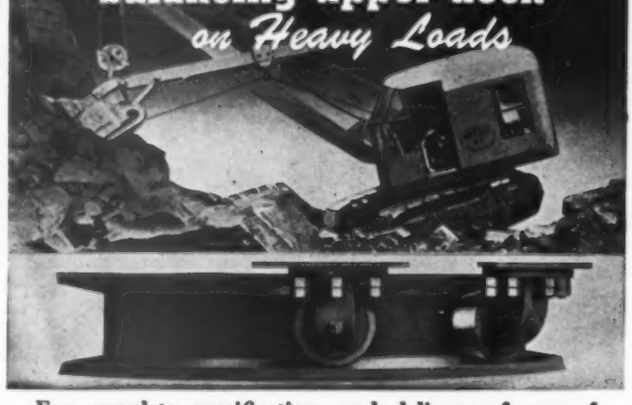
On the job to help you in any way, NOW and for your Post War Plans. Blue Prints or Practical Suggestions sent —No obligation.

Write for . . . Bulletins and Illustrated Catalog No. 601

GRUENDLER
ST. LOUIS, U.S.A.
GRUENDLER

GRUENDLER CRUSHER & PULVERIZER CO.
PLANT and MAIN OFFICE—2915-17 N. MARKET • ST. LOUIS, MO.

BYERS 4 Hook Rollers *Dissipate Strains* **of over-balancing upper deck** *on Heavy Loads*



For complete specifications and delivery of any of Byers ⅜- ½- ⅝- ¾-yd. gas or diesel power shovels, cranes, draglines or back hoes on crawler or truck mountings, see the nearest Byers sales and service headquarters, or wire factory.

Specify
BYERS
CRANES and SHOVELS
RAVENNA, OHIO
DISTRIBUTORS THROUGHOUT THE WORLD

CORONACH

"Of those immortal dead who live again
In minds made better by their presence."

JOHN BYRON GOLDSBOROUGH, civil engineer and authority on the use of compressed air in construction work, died of injuries suffered in a fall at his home on Croton-on-Hudson, N. Y., March 26. He was 79 years old.

Mr. Goldsborough, who was chairman of the board of the Underpinning and Foundation Company, New York, directed subway and other large construction projects.

Born at Apple Creek, Ill., Mr. Goldsborough was educated in the public schools at Minneapolis. A self-trained engineer, he initiated the use of pneumatic devices in laying foundations for bridges on the Great Northern Railroad in 1892.

About 1900 Mr. Goldsborough was called to New York to superintend the use of compressed air in the completion of the Harlem Ship Canal, delayed by a mud wave. He remained in New York as superintendent and chief engineer for the firm of Coleman, Breuchaud and Coleman, civil engineers.

Mr. Goldsborough was active in the planning and construction of water-supply systems in New York and New England. He helped to complete the new Croton Dam and aqueducts in 1906 and aided in the planning and building of the Ashokan Dam and watershed. He also built water works at Lenox and Pittsfield, Mass., and the New York City pumping station at Wards Island.

Four sections of subway in New York City were built by Mr. Goldsborough, after he founded the Underpinning and Foundation Company in 1909.

Donald C. Barrick, Co-Founder of Union Metal, Is Dead

D. C. Barrick

A specialist for over 36 years in the construction and installation of street lighting standards, Donald C. Barrick died March 9 at Lakeside Hospital, Cleveland. He was 59 years old. Mr. Barrick had been associated with The Union Metal Manufacturing Co., Canton, O., almost continuously since he and his father, C. C. Barrick, founded the company in the fall of 1906. He served for a number of years as its secretary and treasurer, and was also a member of its sales staff. Responsible for many outstanding street lighting installations throughout the country, and well known

to municipal and utility officials, he saw the organization which he helped found grow from five employees to approximately 1,100. Because of his intimate knowledge of Union Metal's manufacturing processes and equipment, Mr. Barrick's duties during the present war emergency have been those of Coordinator of Machine Tool Production. He lived in Ohio practically all his life and received his college education at Ohio Northern University. He is survived by his wife, daughter and one grandchild; a brother and a sister.

At the time of his death Mr. Goldsborough was supervising improvements at Floyd Bennett and Roosevelt airports, for the government, as well as of drydocks at Perth Amboy, N. J.

J. W. Gardner of Gardner-Denver Co. Is Dead

J. W. Gardner

The recent death of J. W. Gardner, after a long illness, has again brought into focus the progressive career of one of the country's old-school industrialists. Born August 19, 1863, Mr. Gardner was associated with the Gardner-Denver Company from 1881 until ill health forced him to withdraw from active participation in business several years ago. Mr. Gardner was a student of Illinois College in 1881 when he became a permanent employee in his father's company—the Gardner Governor Company, founded in 1859. In 1883 the company erected a plant in Quincy. In 1905 Mr. Gardner, who had completed his preliminary training by progressing through the various departments of the company, was selected by his father to assume active management. Under Mr. Gardner's able direction, extending over a period of more than sixty years, the Gardner-Denver Company grew from a small concern employing forty men to the present company with its payroll of more than two thousand employees. His unusual ability to select, train and inspire his associates was one of his greatest contributions to the growth and progress of the business. During his period of active management, Mr. Gardner served as President, Chairman of the Board and finally as Chairman of the Executive Committee. A few years ago, ill health forced him to become inactive.

Mr. Gardner's industrial activities resulted in national recognition. He was past president of several national associations and societies, including The National Metal Trades Association, The National Foundry Men's Association, The National Compressed Air Society and The National Hydraulic Society. He also served as Director of The Illinois Manufacturers' Association. He traveled to all parts of the world, primarily for the purpose of visiting the company's many agencies in foreign countries. Even during his period of inactive service, he maintained a keen interest in the company and its extensive affairs.

FAR-LIN PLASTIC SAFETY ROAD MARKERS

NO UPKEEP · QUICKLY INSTALLED MAXIMUM VISIBILITY · PERMANENT WHITE · SURFACE REMAINS ABRASIVE and No Priorities Required!

Safety-ize your county, city and park highways and boulevards with the new FAR-LIN Plastic Safety Road Markers. Made of non-essential white plastic under a patented process under heavy hydraulic pressure, these safety markers will withstand the heavy pounding of traffic without crushing or deterioration, and maintain their skid-proof abrasive surface under wear. They will remain white under all conditions. Quickly installed by your regular road gang with simple tools. Used extensively for crosswalks, curves and winding macadam, asphalt or concrete roads.

LOOK INTO THE MODERATE COST OF FAR-LIN PLASTIC SAFETY ROAD MARKERS FOR YOUR COUNTY, CITY AND PARK HIGHWAYS — WRITE TODAY!

FAR-LIN, Inc. BURLINGTON NEW JERSEY

Flink Spreader . . . Best Answer to Ice Control Problem

The Flink self-feeding spreader is strictly a one man outfit. Operated by driver of cab, who can throw spreader into action as he rapidly approaches, crosses and leaves intersection. Then it can be thrown out of action. Flink spreads forward or backward, full width of street, or less than half width. Handles sand, cinders, etc., up to 1" in size, wet or dry, spreading evenly up to 35' width. Does not limit use of truck for other purposes as Flink spreader fits on end as a tail gate. Positive agitation, no bridging. Flink spreader will pay for itself many times over the first year in labor saved, in extra yardage covered and reduction of complaints.

The FLINK CO., STREATOR ILLINOIS

For particulars write our nearest representatives:

WICO SALES GEO. M. CRAWFORD
5134 W. Cullom, Chicago Empire Bldg., Pittsburgh

G. W. CLEMENTS
421 Townsend Ave., Columbus

With the Manufacturers

New General Manager Is Named by Cummins

The Cummins Engine Co. of Columbus, Ind., manufacturers of Cummins Diesel engines, recently announced several changes in executive personnel, two of them created by the resignation of J. I. Miller, vice president and general manager, to accept the commission of lieutenant in the United States Naval Reserve. Succeeding Lieutenant Miller, who is now on active duty, is V. E. McMullen, former works manager for the company. Taking Mr. McMullen's place as works manager is Carl R. Fox, who advances from the position of assistant works manager.

Other changes find J. D. Allen, credit manager, elevated to the post of assistant sales manager and K. M. Leech, sales engineer, promoted to assistant service manager. Mr. McMullen, since his graduation from the University of Wisconsin 37 years ago, has been continuously engaged in the engine manufacturing business. He joined the Cummins Engine Company in 1935, serving as works manager until his recent appointment as vice president and general manager. Mr. Fox's affiliation with Cummins dates back to 1934. Prior to that time he was connected with several prominent automobile manufacturers. Both Mr. Allen and Mr. Leech are well known to equipment manufacturers and Cummins Diesel owners through their former activities in the credit and sales departments, respectively. Mr. Allen formerly was associated with a major truck manufacturer. Mr. Leech, a graduate of Iowa State University in the school of electrical engineering, joined the Cummins sales organization in 1939.

Bases for BOMBERS
★ Made by HERCULES
★ Delivered by HERCULES

Besides HERCULES Speedraulic Hoists and Dump Bodies for civilian use and the huge Cargo Bodies produced for the U. S. Army, thousands of Airplane Landing Mats for emergency "Bomber Bases" have been turned out by the big Hercules plant the past year. HERCULES Dump Cargo Bodies, like the one shown above, mounted on a Chevrolet chassis, are used for transporting such materials on many fronts.

REMEMBER THESE "HERCULES" FEATURES!
- Exclusive Center-Lift Hoist Action
- Double Bridge-type Lift Arms
- Balanced Piston Valve, with finger-tip control
- 6", 7", 8" and 10" Hoists

Heavy production for war will continue in all lines until victory is won, but if your need is essential, your Hercules distributor can take care of you.

HERCULES STEEL PRODUCTS CO.
GALION, OHIO

Paul Cochran Appointed General Manager of Buckeye

The Buckeye Traction Ditcher Co., Findlay, O., has announced the appointment of Paul B. Cochran as general manager of the company and his election to the Board of Directors. Mr. Cochran, who is well known throughout the construction industry, has been sales manager of Buckeye for the past several years. Buckeye is at present producing power shovels, trenchers, gravel spreaders, tractor equipment and R-B power finegraders, as well as direct war material.

Michigan Tractor & Machinery Co. Organized

H. O. Penn

The Michigan Tractor and Machinery Co., with headquarters in Detroit and a branch established at Grand Rapids, has been organized to serve as distributor for "Caterpillar" and allied machinery and equipment in the Lower Peninsula of Michigan. The new company is headed by H. O. Penn, president of the H. O. Penn Machinery Company, Inc., New York, and until recently supervisor of the tractor and used construction machinery division of the

War Production Board, Washington, D. C. G. E. Rinck, who has been eastern sales manager for "Caterpillar", and was formerly vice-president of the Dakota Tractor & Equipment Co. at Fargo, N. D., is vice-president of the firm. R. E. Reed, former deputy procurement officer in Pennsylvania, and WPB chief, used construction machinery section, is secretary-treasurer. A major portion of the personnel of the Keller Tractor and Equipment Co., former distributor for "Caterpillar" and allied manufacturers, has associated itself with Michigan Tractor and Machinery Co. Don F. Nickel has been named manager of the branch at Grand Rapids. Louis Eilertsen will continue to handle the northern and central Michigan territory. Harry Armstrong is representative in the Detroit district and Burt Kosss has been appointed service and parts manager for Detroit. The new company is now settled in its headquarters at 14341 Schaefer Highway, Detroit, and in its branch office at Grand Rapids, which was formerly occupied by Keller Tractor and Equipment Co. Both are modern, up-to-the-minute establishments carrying complete stocks of parts and equipment. They have ample parts and service facilities and the "know how" for providing the best possible servicing of machinery to "keep 'em working" in these days when it is essential that every owner get the most out of his equipment.

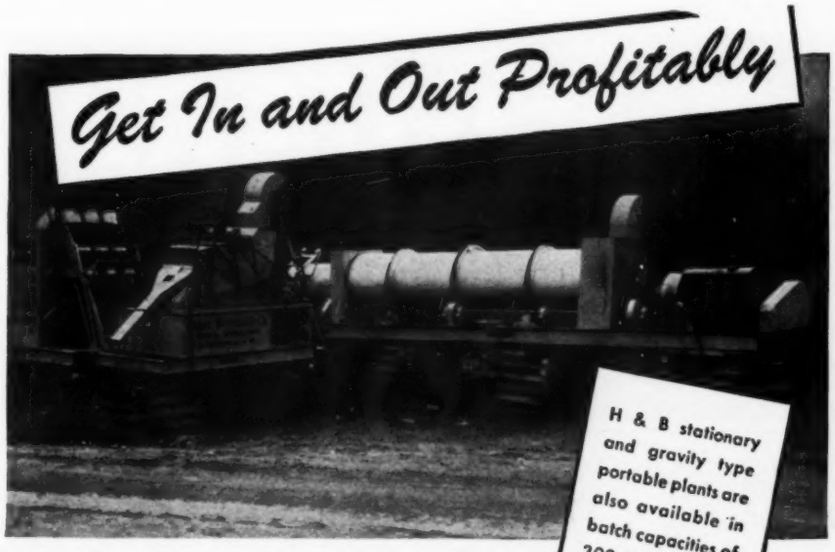
G. E. Rinck

Koppers Co. Transfers District Office to Boston

Transfer of the New England District offices of the Koppers Company, Tar and Chemical Division, from Providence, R. I., to the Boston Consolidated Gas Building, Boston, Mass., has been announced by J. N. Forker, vice president of Koppers Company and general manager of the Tar and Chemical Division. Maurice D. Gill, vice president of Koppers Company, will remain manager of the New England district. Local offices will continue to be maintained at Koppers plants at Everett, Mass., East Providence, R. I., New Haven, Conn., and Portland, Me. The Tar and Chemical Division engages in the sale of roofing and road tars, wood preserving oils, waterproofing materials, bituminous paints, tar acids, light oil distillates, agricultural insecticides and other related chemical products.

Hercules Powder Co. Opens Sales Offices in Boston

Hercules Powder Co. opened sales offices in Boston on April 1, for its Cellulose Products, Naval Stores, Synthetics, Explosives and Paper Makers Chemical departments. The offices are on the seventh floor of the Statler Office Building. Homer C. Simmons, New England manager of sales of the Cellulose Products Department, who is now at Stoneham, Mass., will head his departmental unit in Boston. Howard C. Bates, in charge of Synthetics Department sales for that territory, will be located in the Boston office. W. M. Williams, the newly-appointed resident manager of the Paper Makers Chemical Department's plant at Stoneham, will also head the Industrial Chemical Division sales group of the PMC Department in Boston. G. J. Rising, former resident manager at Stoneham, will be transferred to the Hercules office in Pittsburgh, Pa., where he will represent the Industrial Chemical Division.


Get In and Out Profitably
H & B stationary and gravity type portable plants are also available in batch capacities of 300 to 8,000 lbs.

ON THE SMALL TONNAGE, "HARD-TO-REACH" ASPHALT JOBS...

THE "Brass Brain" (FLUIDOMETER)

This automatic metering system saves time, materials—insures uniformity. For all types of plants.

THIS Model MH Hetherington & Berner portable asphalt plant is a *full-size* wheel mounted plant with all units on the ground—no erection required. The dryer is built on a substantial steel frame, equipped with tandem axle and fifth wheel, permitting the unit to be moved with any standard truck-tractor. The mixer unit, arranged as a semi-trailer, utilizes same axle as the dryer unit. The anti-friction bearings and 2,500 lb. steam jacketed mixer make this the equivalent of stationary plants in sturdiness and capacity. With this plant you can get in and out profitably on the small-tonnage, hard-to-reach jobs, with a minimum investment in running gear. Write for Bulletin RMH-20.

HETHERINGTON & BERNER Inc.
INDIANAPOLIS • INDIANA

H&B Hetherington & Berner

Athey Promotes Ben Lease

Ben Lease

Ben F. Lease, formerly manager of Service and Research, has been made Domestic Sales Manager of the Athey Truss Wheel Co., Chicago, Ill. Well-known throughout the construction equipment industry, Mr. Lease started with Athey in 1931 as District Representative. In a short time he was made Special Representative, and then was given the position to direct service and research. From 1917 until he joined the Athey staff, he was associated with the Republic Truck Co., part of which time was devoted to sales efforts for an affiliated concern, the Linn Manufacturing Co., with his headquarters in Minneapolis. Mr. Lease has been closely connected with the design and development of the Athey MobiLoader.

▼

Company Name Changed

Announcement has just been made of the change in name of Lyons & Rood to The Techkote Company. S. P. Lyons, former member of the firm, has relinquished his interest in the company and is now devoting full time to his contract application business. Ashton Rood continues as manager of The Techkote Company and states that no other personnel changes are planned. The firm manufactures concrete curing compounds and specialized coatings.

▼

Harwood Appointed Regional Highway Engineer for PCA

Warner Harwood

Warner Harwood has been appointed Regional Highway Engineer of the Portland Cement Association for the territory comprising the states of Wisconsin, Minnesota, North Dakota, Iowa, Nebraska, Missouri, Kansas, Arkansas and Oklahoma.

Mr. Harwood received his engineering education at Cornell University from which he was graduated with the degree of Civil Engineer. He has specialized in highway and municipal work, both as a practicing engineer and as an engineer in public work with the Cook County Highway Department in Illinois.

Immediately prior to joining the staff of the Association he was associated with the firm of Charles De Leuw and Co., Consulting Engineers, Chicago. After joining the staff of the Highways and Municipal Bureau of the Portland Cement Association, whose headquarters are at 33 West Grand Ave., Chicago, he was assigned to special design and technical problems.

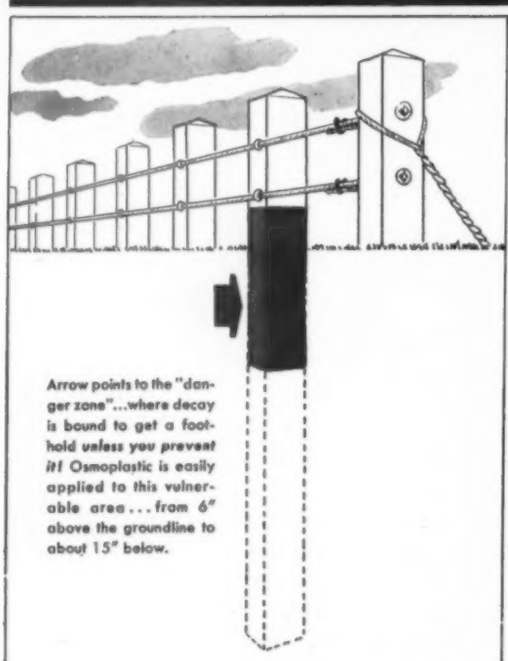
▼

Bernard E. Gray Appointed General Manager of the Asphalt Institute

Bernard Gray

At the recent annual meeting of the Board of Directors of the Asphalt Institute, Bernard E. Gray was promoted to the position of General Manager—adding the duties of that office to those already held as Chief Engineer—with the title of General Manager and Chief Engineer. Mr. Gray has been with the Institute

GUARD
AGAINST
Guard Post Decay
APPLY
OSMOPLASTIC



Arrow points to the "danger zone"...where decay is bound to get a foothold *unless you prevent it!* Osmoplastic is easily applied to this vulnerable area... from 6" above the groundline to about 15" below.

When rotted highway guard posts snap off at the ground line, not only money *but manpower* is the high price paid for neglect. The solution is: Stop decay *where* it starts...*before* it starts ... with OSMOPLASTIC!

Many highway engineers have found this economical method of applying OSMOPLASTIC is highly effective on *all* timber installations... not only guard posts but bridges, culverts, guide and fence posts. Wherever timber touches timber... or humid earth ...or is set in water...OSMOPLASTIC adds valuable *extra years* of service.

It costs little to apply this topnotch wood-preservative, and it is so simple to daub it on. Mail the coupon below for full details as to how you can save your timbers *today* from decay *tomorrow*... with OSMOPLASTIC!

(P. S.: OSMOPLASTIC has a surface coverage of approximately 75 sq. ft. per gallon!)

Osmose Wood Preserving Company of America, Inc. Dept. S
1437 Bailey Avenue, Buffalo, N. Y.
Please send me full information on Osmoplastic applications.

Name _____

Address _____

City and State _____

OSMOSE
WOOD PRESERVING
COMPANY of AMERICA, Inc.
BUFFALO, N. Y.
Denver Chicago New York Seattle
Kenova, W. V. Birmingham San Francisco

for the past thirteen years, successively as Highway Engineer, Chief Highway Engineer and Chief Engineer. Brief biographical data follows:

Born Androver, Mass. Graduated Tufts College, degree B.S. in Civil Engineering, later receiving honorary degree of C.E. Served with the Massachusetts Highway Commission on surveys and construction as Chief of Party and Resident Engineer, followed by several years with U. S. Bureau of Public Roads as Engineer-Economist, Highway Engineer and Senior Highway Engineer. Orientation Officer with 38th Artillery in World War I. Appointed 1919 member of Governor's Committee to write new State Highway Law of West Virginia, later Division Engineer and Chief of Maintenance for the State during its heavy construction era.

Member of Highway Research Board, West Virginia Professional Engineers' Association, etc. Author of numerous technical articles on design, construction and maintenance of highways and airports; co-author with Prevost Hubbard, Chemical Engineer of the Institute, of the textbook "Asphalt Pocket Reference for Highway Engineers." Residence, 135 Brewster Road, Scarsdale, New York.

▼

New Directors of Blaw-Knox

Albert L. Cuff

Albert L. Cuff, William Frew, and Charles M. Thorp, Jr. have been elected directors of the Blaw-Knox Co. to fill vacancies on the board. Mr. Cuff has been affiliated with the company since 1928 and has been secretary and general counsel since 1937. Mr. Frew is a partner in the New York Stock Exchange firm of Moore, Leonard & Lynch, is a trustee of the Dollar Savings Bank of Pittsburgh, and is chairman of the executive committee of trustees of the Carnegie Institute of Technology and vice president and trustee of the Carnegie Institute. Mr. Thorp is a member of the law firm of Thorp, Bostwick, Reed & Armstrong, and a director of the Edgewater Steel Company and Pennsylvania Industries, Inc.

Charles M. Thorp, Jr.

William Frew

▼

W. S. Newell Appointed to Mack Board

Appointment of William S. Newell to the board of directors of Mack Trucks, Inc. has been announced by Louis G. Bissell, chairman of the Mack board. Mr. Newell is president of Todd-Bath Iron Shipbuilding Corp. and president of Bath Iron Works. Along with his new appointment at the Mack company, Mr. Newell holds directorships in the Maine Central Railroad, Fay and Scott, Bath Savings Institution and the Union Mutual Life Insurance Co. He also is a trustee of Colby College and Webb Institute of Naval Architecture. Mr. Newell has degrees from the Massachusetts Institute of Technology, Bowdoin College and Colby College. He is vice president of the American Society of Naval Architects and Marine Engineers, a member of the Institution of Naval Architects of Great Britain, North East Coast Institute of Shipbuilders and Engineers, American Society of Naval Engi-

BITUVIA
Road Tar
for Essential Maintenance Work

★ Maintenance of main highways and principal feeder roads is the big job of the year for the road building industry. BITUVIA offers distinct advantages for maintenance work. It is quickly applied, penetrates deeply, binds firmly, and has a resilient, skid-resistant surface that contributes to safe driving and longer tire life. Standard grades to meet all Federal, State, County and Municipal specifications. . . . REILLY engineers will be glad to assist in the preparation of your application to the P.R.A. for your requirements of BITUVIA in essential maintenance construction.

Reilly
COAL TAR PRODUCTS

Write for pocket-size BITUVIA *manual.*

PLASTUVIA CRACK FILLER — Plastuvia is a waterproof filler which bonds firmly to brick and concrete, filling and sealing cracks and openings to prevent water damage. Will not flow or pull in summer, nor chip in winter.

REILLY TAR & CHEMICAL CORPORATION
Merchants Bank Bldg., Indianapolis, Ind.
500 Fifth Ave., New York 2513 S. Damen Ave., Chicago
★17 PLANTS to Serve the Nation

neers, American Committee of Lloyd's Register of Shipping, American Bureau of Shipping, New York Chamber of Commerce, Boston Chamber of Commerce and the New England Council. He was born in Albany, N. Y., May 31, 1878, and at present makes his residence in Bath, Me.

Receives Bok Award

William Loren Batt, vice-chairman of The War Production Board and president of SKF Industries, Inc., Philadelphia manufacturers of ball and roller bearings, has been awarded the Bok Award—a medal and a $10,000 check—not only for his service to the Nation in leading industrial mobilization of the war, but as a citizen who performed the most distinguished service for Philadelphia in 1942. This award is the twenty-first since its inception by the late Edward W. Bok in 1921.

Rickenbacker Greets Old Auto-Racing Friends at Marmon-Herrington

It was "old home" day when Eddie Rickenbacker recently visited the Marmon-Herrington Company, at Indianapolis, and found a large group of his old Speedway "buddies" at work there.

Rickenbacker Greeting Bill Endicott. In center Col. A. W. Herrington

Greeting "Rick" at the plant, where the roar of armored tanks under test replaced the thunder of racers around the Speedway track, were Col. A. W. Herrington, chairman of the board of directors of Marmon-Herrington and chairman of the Technical Committee of the Speedway, Bert Dingley, National AAA Racing Champion in 1909, now president of Marmon-Herrington, Seth Klein, official starter of Speedway races and a Marmon-Herrington vice president, "Snappy" Ford, chief timer of Speedway races, George Freers and S. E. Rowe, members of the AAA Technical Committee, Nick Meo, an official observer at the races, Bill Endicott, a driver in the first 500-mile race, and Ora Haibe, who drove in several Speedway races.

Also, at the Merz Engineering Company, he found Charlie Merz, president of the Merz Company and official representative of the AAA Contest Board for Indiana, Lee Oldfield, assistant chairman of the Speedway Technical Committee, Earl J. Breech, Merz treasurer and a director of the Speedway, and Tommy Thompson, a member of the Speedway Technical Committee.

Touring the Marmon-Herrington plant with company officials, Rickenbacker recognized many other familiar faces among employees, and "Hello, Rick, glad to see you" came from all corners of the plant.

Rickenbacker was in Indianapolis for an address, where he spoke to more than a thousand dinner guests at the Scottish Rite Cathedral, in his campaign to awaken America to the seriousness of the war.

Give 'em air and they'll get things done in a hurry . . . Whether it's building a flying field in Alaska or chipping a casting in Cairo you can depend on SCHRAMM all-weather compressors to deliver unfailing power to the tools.

Because these compressors are 100% water-cooled (not half-and half), their performance is unaffected by outside temperatures—no sticking, no overheating, and correct lubrication at all times. Schramm's straight-lined design saves much critical material and, without sacrificing either power or stamina, they weigh as much as 40% less than others of equal capacity.

GASOLINE — DIESEL — ELECTRIC

You know which size, type and drive is best suited to your requirements. Schramm knows best how to build it. For back of every compressor bearing our name are 42 years of engineering and research.

Send today for new Catalog—Illustrations, facts, figures and prices. All the information you need before deciding on the type and size best suited to the job on hand . . . Priorities allocated to government jobs assure prompt delivery.

SCHRAMM THE COMPRESSOR PEOPLE
INCORPORATED
WEST CHESTER, PENNA.

Pittsburgh Steel Gets 2-Plant "E" Award

In separate ceremonies, Army-Navy "E" recognition was granted to both the Allenport and Monessen, Pennsylvania, plants of the Pittsburgh Steel Company, March 18, 1943, conferring the unusual honor of a two-plant award to one company in a single day. The first ceremony was held at the Allenport Works at noon followed by similar exercises at Monessen at 4 p. m. Lt. Col. Ralph L. Dunckel, Deputy Chief, Industrial Division, Pittsburgh Ordnance District, presented the "E" flags which were accepted for the company by E. J. Protin, operating vice president. Commander Carl E. Egeler, in charge of Naval Inspection, Munhall-Pittsburgh area awarded token lapel "E" pins to representative employees of the company. At Allenport, Benjamin F. Nichols, President, Local 1187 U.S.A.-C.I.O., accepted for the employees; at Monessen, Stephen Wisyanski, President, Local 1229 U.S.A.-C.I.O., responded for the employees. Officers of the Army and Navy, officials of the company, and thousands of employees participated in the ceremonies conducted by George Heid, M.C., pledging continued production support to the more than 2,000 Pittsburgh Steel men in the armed forces.

Holding Army-Navy "E" Flag at Allenport plant of Pittsburgh Steel Company—Left to right: Lt. Col. Ralph L. Dunckel, Deputy Chief, Industrial Division, Pittsburgh Ordnance Division; P. E. Sance, Works Manager, Seamless Tube Division; Joseph H. Carter, President; Henry A. Roemer, Chairman of Board; E. J. Protin, Operating Vice President; Commander Carl E. Egeler, U.S.N.R. Naval Inspection, Munhall-Pittsburgh area.

WILLIAMS *Buckets*

WELDED ROLLED STEEL CONSTRUCTION

• Welded design formerly used only in steel mill and dredging buckets for heavy duty service is now utilized in *all* Williams Buckets.

ALL TYPES OF CLAMSHELL, DRAGLINE, and CUSTOM-BUILT BUCKETS. ⅜ to 16½ yd. capacities

LIGHTER—STRONGER—LESS BREAKAGE
LONGER SERVICE

Send for free descriptive bulletin which shows clearly why your next bucket should be a Williams.

Built by
THE
WELLMAN
ENGINEERING
COMPANY
7003 Central Ave. • Cleveland, Ohio

ARMY E NAVY

SAVE Manpower

The anwer is the Root F-33 Curved Moldboard Hydraulic Scraper. Fast, Mobile, and easy to operate.

Grading—Shoulder Work—Snow and Ice.

ROOT SPRING SCRAPER CO.

Kalamazoo, Michigan

Builders of Truck Maintenance Equipment for more tahn 50 Yrs.

★ ★ ★ Sell your Typewriter to Uncle Sam. Call the nearest Underwood Elliott Fisher Branch Office for details ★ ★ ★

UNDERWOOD ELLIOTT FISHER COMPANY

105 W. Adams St.
Chicago, Illinois

RANDOLPH 4680

Caterpillar Tractor Co. Awarded Army-Navy "E"

Caterpillar Tractor Co.'s 17,000 employees received the Army-Navy "E" Award, March 12, in a colorful, impressive ceremony witnessed by approximately 25,000 persons. Brigadier General David McCoach, Assistant Chief of Engineers and Chief, Administration Division, Office of the Chief of Engineers, presented the "E" burgee, to be flown over Peoria's largest industry "because you have kept the faith—because you have done everything demanded of you, and more. It is the visible symbol of what the United States Government, your Government, thinks of your work."

Holding the "E" flag are, left to right, L. B. Neumiller, "Caterpillar" President, Brig. Gen. David McCoach, representing the Army; Captain E. A. Lofquist, representing the Navy and Merritt Miles, "Typical Employee."

Captain E. A. Lofquist, Chief of Staff, Ninth Naval District, presented token "E" pins to five employees "as symbols of their effort toward victory". L. B. Neumiller, president of "Caterpillar", accepting the flag from General McCoach, urged that the future be faced with calm courage and unfaltering determination. Merritt Miles, 32-year-old automatic lathe operator, was chosen to respond to the presentation of the "E" pins, on behalf of his fellow employees. He said, "We've got our 'E' and we want to keep it. When our buddies come back from the mud-holes and the deserts overseas, and after they've marched victorious through the streets of Berlin and Tokyo, we want them to tell us that we, too, on the production front, have fought a good fight."

Elects Officers

Neil C. Hurley, Jr., was elected executive vice-president of the Independent Pneumatic Tool Company at a meeting of the Board of Directors following the firm's annual stockholders' meeting. Mr. Hurley has been associated with the Company for 11 years, serving the past four years as vice-president and director.

John A. McGuire was elected secretary, and E. R. Wyler was named vice-president with headquarters in New York City. All other directors and officers were re-elected.

"INCOMPREHENSIBLE?"

It's astounding how we get along without many things heretofore considered necessary. The reason is simple—we use the essentials—among which are "FLEX-PLANE" joint installing and finishing machine equipment.

Steel and powder backed by BONDS will win war.

FLEXIBLE ROAD JOINT MACHINE CO.

Warren, Ohio, U. S. A.

TAKE GOOD CARE OF YOUR

HERCULES ROAD ROLLERS!

Keep 'em cleaned, adjusted, lubricated and repaired! Send for free Booklet H-3713 "Operation and Care of Hercules Rollers."

THE HERCULES COMPANY
MARION - OHIO

A SUPER FRAME FOR A SUPER TRAILER!

Here's a trailer frame that isn't going to sag. It is extra heavy and well braced. Beams are deep and have wide flanges and more cross members are used for rigidity. It gives you strength without added weight.

Jahn Trailers have built up an enviable reputation for load carrying ability and freedom from frame troubles. This can easily be checked by contacting the hundreds of Jahn Trailer owners throughout the country.

You probably are making plans for the future. Let us send you the new Jahn Trailer Catalog to help you.

C. R. JAHN COMPANY • 1345 W. 37th Pl. • Chicago

Any Axle or Wheel Combination

JAHN *Heavy Duty* TRAILERS
Capacities from 5 to 100 TONS

"COME TO TRAILER HEADQUARTERS"

NEW TRADE LITERATURE

"HOW TO SELECT THE PROPER CONCRETE MIX" and estimate quantities of materials needed, is given in a handy pocket-size folder of the above title issued by the Portland Cement Association, 33 W. Grand Ave., Chicago. Case examples given for various typical types of jobs along with tables useful for quick estimating.

▼

HOW TO GET MAXIMUM SERVICE from portable electric tools is told in a new manual published by the Independent Pneumatic Tool Company, manufacturers of Thor electric tools.

A 20-page, pocket-size booklet, it contains complete and brief instructions on the proper operation and care of all types of portable electric tools. Special attention is given to the more common and simple problems in connection with the maintenance of the motor, cable, switch and brushes. "Right" and "Wrong" operating methods are clearly stated and pictured with simple instructions. Full information on what to do when a tool fails to operate is also covered.

Copies may be had by requesting Booklet No. JE-199 from the Independent Pneumatic Tool Company, 600 West Jackson Blvd., Chicago, Illinois.

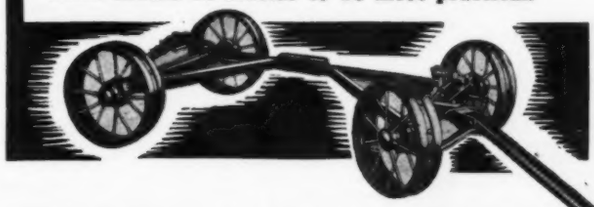
▼

"TOURNAWELD" BROCHURE—R. G. LeTourneau, Inc., Peoria, Illinois has just issued a colorful brochure, Form No. WT-108, describing concisely the "7 Tournaweld Rods" it manufactures for fabrication and repair use. Copies are available from LeTourneau — "Caterpillar" distributors or by writing to R. G. LeTourneau, Inc., Peoria, Illinois.

TAKE THE MACHINE TO THE JOB!

Let Us Plan EWC WHEELS and MOUNTINGS For Your Stationary Equipment!

Almost any type of machinery can be made more efficient if it is made portable—with the help of EWC Wheels, Axles, Springs, Tongues, etc. In these fast-moving days, when minutes count, equipment should be mobile to be most practical.



Write us for Illustrated Bulletins—and for sound engineering help based on more than 50 years of manufacturing experience.

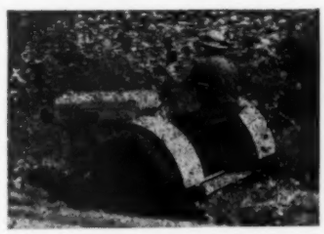
EWC WHEELS

ELECTRIC WHEEL CO.
Dept. RS, Quincy, Ill.

⅛ *Cu. Yd.* — 8' *Lift*

FRONT END SHOVELS
for Industrial Tractors
Write for Catalog
Elkhart White Mfg. Co. Indiana

SILVER KING
HIGHWAY MOWER



● **Watch out for those minor damages that might put your highway mower out of action for the duration. A little extra care prevents extra wear and repair!**

If you own a Silver King, you'll see, more than ever, what it means to have a mowing unit ENGINEERED for the job. If you want replacement parts now to insure tip-top "good-as-new" performance *tomorrow*, write. We will be glad to serve you.

MANUFACTURED BY
THE FATE-ROOT-HEATH CO.
PLYMOUTH, OHIO

Clearing House

P&H 600 No. 3053 Shovel, 1 yd., 40' Boom. Good shape, load now, FOB Mo., $6,000.00.

Thew Lorain 1¼ wide Dipper, 32T. Wt. FOB KC. $4,000.00. Old but good, all gears 90%. Fine for coal or rock.

Byers rebuilt Bearcat Jr., high lift, late model Shovel, air tired factory trailer. FOB KC., $4,500.00. Ready to go.

We have practically everything you need.

Call Wire Write

KENNEY MCHY. CO.

2136 Jefferson, Kansas City, Mo.

EXCEPTIONAL BARGAINS
IMMEDIATE SHIPMENT

FOR SALE:

44C Barber-Greene Ditcher.
10S Koehring Mixer on 2 Pneumatic Tires.
4" Rex Self Priming Pump—Gasoline Power.

FOR RENT:

522 Barber-Greene Pneumatic Tired Bucket Loader—Gasoline Power.

PAUL L. MATCHETTE COMPANY

Exclusive Distributors for Barber-Greene Co.

Missouri — Kansas — Oklahoma
20 West 9th Street, Kansas City, Mo.

TRANSITS and LEVELS

New or Rebuilt
Sale or Rent

Headquarters for REPAIRS — any make. Factory Service. We will also *buy* your old instruments or take them in *trade*.

A complete line of Engineering Instruments and Equipment for Field or Office. Write for Bulletin RS 84.

WARREN-KNIGHT CO.

Manufacturers of Sterling Transits and Levels
136 N. 12th St. Philadelphia, Penna.

BE PREPARED—*Buy Now*
Critical Construction Machinery

CRANES

Rebuilt P & H Model 206 Crawler Crane, ¾ yard capacity, powered by a four cylinder Waukeshaw gas engine driven motor, complete with a 40' boom and equipped with a ¾ yard Page Dragline Bucket.

Rebuilt P & H ½ yard Truck Crane, gas engine driven, equipped with 25' boom, complete with ½ yard Clamshell Digging Bucket, mounted on 10-wheeled pneumatic tired American-LaFrance Truck, complete with outriggers and lifting capacity 11 tons, 12' radius, tires 50% good.

Rebuilt P & H ½ yard Truck Crane, equipped with 20' boom, ½ yard Clamshell Bucket with digging teeth and mounted on Stewart tandem truck, lifting capacity 11 tons, 12' radius, tires 50% good.

Rebuilt P & H Truck Crane, ½ yard capacity, serial # 1348, Engine C-752-58, powered by a Mack gas engine #1779—Crane engine, International gas —6 cylinders, model F.A.D., mounted on a 10-wheeled Bulldog Mack reinforced Frame Truck, complete with double outriggers and 30' boom. Tires 70% good.

GENERATORS

11—New Kohler 1½ KVA, AC, 1500 watt, gas engine driven, 120 volts, single phase, Lighting Generators.

5—New Kohler, 10 KVA, 240 volts, 3 phase, 60 cycle, gas engine driven Generator Sets, manual control with or without housing.

5—New Lister-Blackstone "Nite-Hawk" Portable 5 KW, 120 volts, AC, single phase, 60 cycle, Generator Sets, complete with four 1,000 watt Crouse-Hinds reflectors mounted on 8' telescopic extensions mounted on two-wheel spring mounted trailer.

1—Rebuilt 50 KVA Superior diesel engine driven Generator, V-belt drive, 220 volts, 3 phase, 60 cycle, AC Generator, .8 power factor, powered with Superior 100 h.p. 6-cylinder diesel engine. Machine in excellent condition.

1—Rebuilt 18.7 KVA Superior diesel engine driven Generator, direct connected, powered with 2 cylinder engine, 1200 r.p.m. and Columbia Generator, 220 volts, 3 phase, 60 cycle, .8 power factor. Machine in excellent condition.

1—Rebuilt Buda 15 KW gas engine driven Generator Set, 110 volts, DC.

1—Rebuilt Winton 7½ KW Gas Engine Generator Set.

ROLLERS

1—Rebuilt Galion Chief 1940 Model, 10-ton, 3-wheel, gas engine driven, 24" rolls, equipped with starter, lights, and scarifiers.

1—Rebuilt Galion, 5-ton, 3-wheel, gas engine driven Roller, powered by a McCormack-Deering 4-cylinder engine.

BUCKETS

1—Used Haise ½-yard Clamshell Bucket.

1—Used Page 1-yard Dragline Bucket.

1—New Williams Model 20X, ¾-yard Dragline Bucket.

WAGON DRILLS

1—New Cleveland DR-30 Wagon Drill, mounted on two steel-wheeled trailer, with 4" drifter drill, 6' steel change.

2—Rebuilt Cleveland WDA-10 Wagon Drills, mounted on steel wheels, 4" drifter drill, 10' steel change, used three months, new machine guarantee.

1—Rebuilt Cleveland DR-8 Wagon Drill, used two months, guaranteed.

MISCELLANEOUS

1—Used Kerrick Cleaner, mounted on two pneumatic tires.

1—Used 10-S CMC Mixer, on 4 rubber-tired wheels, with calibrated batch meter and tank.

1—Rebuilt Caterpillar "60" Tractor and Bulldozer.

1—Used GMC ½ ton Panel Truck.

1—Used Adams 10' Pull Grader.

1—Used Gledhill Road Leveler on rubber tires.

Our modern shop for your convenience

CRANES • COMPRESSORS • GENERATORS • ROLLERS

CCEC CHICAGO CONSTRUCTION EQUIPMENT CO.

13912 SOUTH HALSTED ST. • CHICAGO, ILL.

PHONE RIVERDALE 1300

CLEARING HOUSE

FOR SALE

1—12' Caterpillar "60" Grader with Scarifier
1—9' Russell No. 3 Grader
1—800-gallon Etnyre Asphalt Distributor, Model F, mounted on dual-tired semi-trailer and Chevrolet truck
1—Retort Type Asphalt Heater, complete with boiler, pumps, recording thermometer, and fittings
1—Lot Miscellaneous Small Tools.

Box 910, Roads & Streets
330 So. Wells St. Chicago, Ill.

FOR SALE

1—Goodroads 10"x30" Jaw Crusher. Roller bearings.
1—No. 3 Austin Gyratory Comb. Crusher.
1—Ingersoll-Rand Air Compressor.
1—Ford Skip Truck. 4 Boxes.
2—Elevators, 1—38" double, 1—24" double.

PAUL GOODWIN
Otisco, R. No. 1, Indiana

EQUIPMENT FOR SALE

1—Austin-Western 4-44 — all wheel drive and steer—9.00 x 24 dual rubber tired tractor.
1—Cletrac DDH tractor.
1—Caterpillar "60" gasoline tractor.
1—Ateco scraper to fit Cat. "60".
1—Niagara 2 deck 3' x 3' screen.
1—Austin-Western 32" x 14' revolving screen.
1—6" Centrifugal pump — 2 stage — with 4 cylinder Hercules motor.
1—No. 104 Austin Gyratory crusher with back gear.

Subject to prior sale.

TELFORD EQUIPMENT COMPANY
319 East North Street, Lansing, Michigan
Tel. 4-3424

---

2 SHOVELS and 1 DIESEL ENGINE FOR SALE

Bay City K-2; Bay City K. ½ yard each.
Diesel Engine, Buda. 6 cyl. 3⅝x4⅝.

ULSTER DISTRIBUTING COMPANY
Telephone 700 Kingston, N. Y.

TIRE REPAIRS

In all sizes of tractor, truck, wheelbarrow, passenger, or 1800x24 tires.
An EQUA-FLEX "Sectional" repair constructed in your tire is guaranteed. Best results and prompt service!
We have a selection of pre-war quality used passenger and truck tires.

WALLACE TIRE SERVICE, Inc.
3239 S. Michigan Ave. Chicago, Ill.

FOR SALE

Cummer Asphalt Plant—One ton box. New 1940. Located in New England. Complete for $22,000.
6000 lb. Cummer Asphalt Mixing Box. Used 3 months. Complete with 40 ton bins and new 60 H.P. Gearmotor. Located in New England. $4,500.

Box 920, Roads and Streets
330 So. Wells St. Chicago, Ill.

WANTED FACTORY CONNECTIONS

Sales and Engineering organization with complete coverage of Pacific Coast markets wants to represent two or three additional reputable manufacturers. Present representation available but principally interested in post war activities.

Address replies to Box 900, Roads and Streets, 330 S. Wells St. Chicago

---

FOR SALE:

3—20,000 gallon capacity storage tanks
30 x 10 Portable CRUSHING PLANT
4 x 8 Telsmith Vibrating SCREEN
3—900 x 1,000 Gal. DISTRIBUTORS
18 in. x 200 ft. BELT CONVEYOR
½ yd. Owen CLAMSHELL
2—1,000 ft. DIESEL AIR COMPRESSORS
30—1½ yd. and 3 yd. DUMP CARS
6 ORANGE PEELS—6 to 27 ft.
100 H.P. Lambert three drum ELEC. HOIST
5 Parsons & Cleveland TRENCHERS
2—2½ and 3 ton tandem gas ROLLERS
½ yd. P. & H. Gas Cat. Dragline
5—6 to 10 Ton Gas Locomotives
9 Vulcan & McKiernan Terry Pile Hammers
5 Gunite N1 & N2 Cement Guns
4 KW Kohler lighting plant

Tidewater Equipment & Machy. Corp.
305 Madison Ave. New York, N. Y.

WANT TO BUY

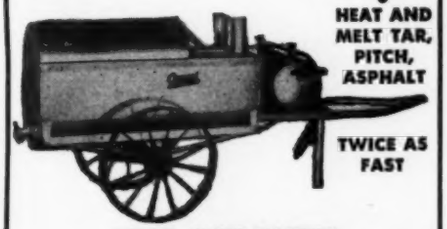
2 Locomotive Cranes
2 Whirley Cranes 30' or 125' Boom
5 Portable Conveyors 40' to 60'
2 1¼ to 2 ton Tandem Rollers
6 10,000 Gal. Cap. Steel Tanks
1 Mile Portable Track

Leicester Contracting Corporation
305 Madison Ave., New York, N. Y.

EQUIPMENT WANTED

WANTED: One R-B Fine Grader, late model and in good condition. One shovel front for Model 18 Northwest Crane. Apply Phil H. McGuire, Box 34, 35th St. Station, Norfolk, Va.
WANTED: Grade Foreman for State Highway work. Experienced on Excavators Equipment. Steady work. Salary. Box 930, Roads and Streets, 330 S. Wells St., Chicago, Ill.
WANTED: ½ Cu. Yd. Back hoe for Bucyrus-Erie or Bay City Shovel. Write E. E. AUSTIN & SON, 1919 Reed St., Erie, Pa.

SAVE 50% ON FUEL AND WAITING TIME



HEAT AND MELT TAR, PITCH, ASPHALT

TWICE AS FAST

AEROIL "HEET-MASTER"

Complete outfits on skids or on steel tires, capacities 80, 115 and 165 gallons. Larger units can be obtained with hand sprays and barrel hoists. Send for FREE BULLETIN No. 194RS. For full information of concrete curing machines, tool and surface heaters, asphalt tools and accessories, etc. Write for FREE Catalog No. 240RS.

NEW cleaning and degreasing tanks are sprayers to keep equipment in condition (Bulletin 250RS).

AEROIL BURNER CO., INC.
5711 PARK AVE. WEST NEW YORK, N. J.
Branches: Chicago, San Francisco, Dallas

VULCAN PAVEMENT AND CLAY DIGGING TOOLS

ARE MADE in a complete line of sizes to fit all standard compressed air hammers.

Send for NEW Vulcan illustrated CATALOG today.

VULCAN TOOLS — THE WORLD OVER — NOTED FOR QUALITY AND DURABILITY"

VULCAN TOOL MFG. CO.
QUINCY, MASS.

RELIANCE

CRUSHING, SCREENING and WASHING UNITS

● Up to 2000 Tons a Day ●

Crushers	Bins	Drag-Lines
Elevators	Pulverizers	"GAYCO"
Sweepers	Feeders	Centrifugal
Screens	Spreaders	Air Separators
Wash Boxes	Kettles	
	Conveyors	

UNIVERSAL ROAD MACHINERY CO.
Kingston, N. Y.

Canadian Representatives: F. H. Hopkins & Co., Ltd. 340 Canada Cement Co., Montreal, Que., Can.

POSITION WANTED—As General Superintendent or Superintendent. Have 35 years' experience building all phases of Federal, State, Counties and Cities projects. Airports, Highways, and Street Paving. Heavy and light grading. Concrete bridges, interceptor sewers, water lines, foundations and flood walls. Familiar with modern equipment, and government regulations. Qualifications covers any projects. Organizer and knows cost. Available immediate connection. Age 51. Best of references. Box 1010, Roads and Streets, 330 So. Wells St., Chicago, Ill.

ALL OUT FOR THE WAR EFFORT AND VICTORY!

BUT FULLY PREPARED TO MEET YOUR POST WAR PLANS

★ In Trojan equipment you will have machines that will make "after victory" contracts more successful. We are looking forward to the post war era when we can again take care of your normal requirements.

Trojan equipment includes GRADE RIPPERS —TAMPING ROLLERS—SHOULDER EXCAVATORS—SCRAPERS—MAINTAINERS—GRADERS—SNOW PLOWS.

CONTRACTORS MACHINERY COMPANY, Inc.

BATAVIA, NEW YORK, U. S. A.

MOVE MORE YARDS Per DOLLAR

IT costs but a few cents per cubic yard to dig, haul and place a big load of any material with a SAUERMAN Power Drag Scraper or Slackline Cableway. The low cost and large capacity of these machines is proved daily on hundreds of jobs.

SAUERMAN Machines are designed in suitable sizes and types to cover the requirements of every dig-and-haul job and each machine, whether large or small, offers the greatest possible economy of power and labor.

Write for Catalog

SAUERMAN BROS., Inc.

588 S. Clinton St., Chicago

Index to Advertisers

The Dash (—) Indicates that the Advertisement Does Not Appear in This Issue

A

*Adams Company, J. D.....Second Cover
*Aeroil Burner Co., Inc..... 97
Albi Chemical Corp..... —
Allis-Chalmers Tractor Division..... 13
Alloy Steel & Metals Co..... —
American Bridge Company ..... —
American Cable Division...Third Cover
American Chain & Cable Co, Inc....
.....Third Cover
American Creosoting Co. ..... —
American Cyanamid & Chemical Corp. —
American Steel & Wire Company... —
Anthony Co. ..... —
Armco Drainage Products Ass'n.... —
Athey Truss Wheel Co..... —
*Austin-Western Road Mach. Co..... —
Auto Gear & Parts Co..... —

B

*Baker Manufacturing Co., The..... —
*Barber-Greene Co. 4
Barrett Company, The..... 61
*Bethlehem Steel Company..... 1
Blackhawk Mfg. Co..... —
*Blaw Knox Company..... 5
Briggs & Stratton Corp..... 54
Brooks Equipment and Mfg. Co..... —
*Buckeye Traction Ditcher Co...6-7-14-31
Bucyrus-Erie Co. 37
*Buffalo-Springfield Roller Co..... 85
*Burch Corporation, The..... 80
Byers Machine Co., The..... 86

C

Calcium Chloride Association..... —
Chicago Constr. Co..... 96
*Cleaver Brooks Company..... —
Cleveland Diesel Engine Division.... —
Cleveland Rock Drill Co., The..... —
*Cleveland Tractor Co., The..... 59
Colorado Fuel and Iron Corp.....17-18
Concrete Cutting Corp..... —
Concrete Surfacing Machinery Co.... —
Continental Motors Corp..... —
Contractors Machy. Co., Inc. 98

D

Deere, John ..... —
Detroit Diesel Engine Division..... —
Diamond Iron Works, Inc..... —
Dietz Company, R. E..... 66
Dixon Valve & Coupling Co..... —

E

Electric Wheel Co..... 95
Electro Motor Division..... —
Empire Electric Brake Co..... 30
*Etnyre & Co., E. D. 83

F

Far-Lin, Inc. 87
Fate-Root-Heath Co., The..... 95
*Flexible Road Joint Machine Co.. 94
Foote Company, Inc., The..... 28
Flink Co. 87
*Four Wheel Drive Auto Co., The.... 23

G

*Galion Iron Works & Mfg. Co., The. 9
Gatke Corporation ..... —
Gemmer Manufacturing Co..... —
*General Excavator Company 94
General Motors ..... —
Gohi Culvert Manufacturers, Inc.... —
Grace Mfg. Co., W. E..... —
Grohne Concrete Products Co..... —
*Gruendler Crusher & Pulverizer Co.. 86
Gulf Oil Corporation..... —

H

Hazard Wire Rope Division..... —
*Heltzel Steel Form & Iron Co..... 11
*Hercules Co. 94
*Hercules Power Company..... 15
Hercules Steel Products Co..... 88
Hetherington & Berner, Inc..... 89
Hotel Fontenelle ..... —
Hotel LaFayette ..... —
Hi-Way Service Corp..... 72
Huber Mfg. Co..... 21

I

*International Harvester Company... 25
*Iowa Mfg. Co..... 20

J

Jahn Co., C. R..... 95
*Jaeger Machine Co., The..... 81
Jones & Laughlin Steel Corp..... —

K

Kenney Machy. Co..... 96
Keystone Asphalt Products Co..... 34
Klauer Manufacturing Co..... —
Koehring Company 19
Koppers Company ..... —
*Kotal Company ..... —

L

*La Crosse Trailer & Equipment Co.. 80
Leicester Contracting Corp. ..... —
Le Tourneau, Inc., R. G..... —
Lima Locomotive Works, Inc..... —
*Littleford Bros. 12

M

Mack Trucks, Inc..... —
Macmillan Petroleum Co..... —
Magnus Chemical Co..... 82
Marion Steam Shovel Co., The..... 33
*Marmon-Herrington Company, Inc... 27
Matchett Co., Paul L..... 96
*Michigan Power Shovel Co..... 35

N

National Automotive Fibres, Inc.... —
National Paving Brick Association.. —
Norgahn Co. ..... —

O

Ohio Oil Company, Inc., The..... —
*Osgood Company, The..... 94
Osmose Wood Preserving Co..... 90
*Owen Bucket Co., The..... 32

P

Paris Manufacturing Co., Inc..... —
Pierce Governor Co., The..... —
*Pioneer Engineering Works..... 62
Pitman Publishing Corp..... —
*Portland Cement Association..... —
Preformed Wire Rope..... 26

R

*Rapid Pavement Breaker Corp..... —
Raybestos Division ..... —
Raybestos-Manhattan, Inc. ..... —
*Reilly Tar & Chemical Corp..... 91
Riddell Corp., W. A..... —
Rogers Brothers Corporation..... 32
Root Spring Scraper Co. 94
Rototiller, Inc. 24

S

*Sauerman Bros., Inc..... 98
Schramm, Inc. 92
Seaman Motors ..... —
Shannon & Co., J. Jacob..... —
Sheppard Co., R. H..... —
Sinclair Refining Co..... 74
*Sisalkraft Co., The..... —
Standard Oil Company of California. 22
Standard Oil Company (Indiana)... 82
Star-Lite Co., The..... —
Stulz-Sickles Co. 82

T

Telford Equipment Co. 97
*Texas Co., The.....Back Cover
Thew Shovel Co., The..... 3
Thornton Tandem Co..... —
Tidewater Equipment & Mchy. Corp. 97
Timber Engineering Company, Inc.. 71
Timken-Detroit Axle Co..... —
*Timken Roller Bearing Co...Front Cover
Toncan Culvert Mfrs. Ass'n..... —
Truscon Laboratories 38
Tuthill Spring Co..... —

U

Union Metal Manufacturing Co., The 10
United States Steel Corp..... —
Universal Atlas Cement Co..... —
Universal Crane Division..... —
*Universal Engineering Co. 8
Universal Road Machinery Co..... 97
Universal Unit Power Shovel Corp.. —

V

Vulcan Tool Mfg. Co..... 97

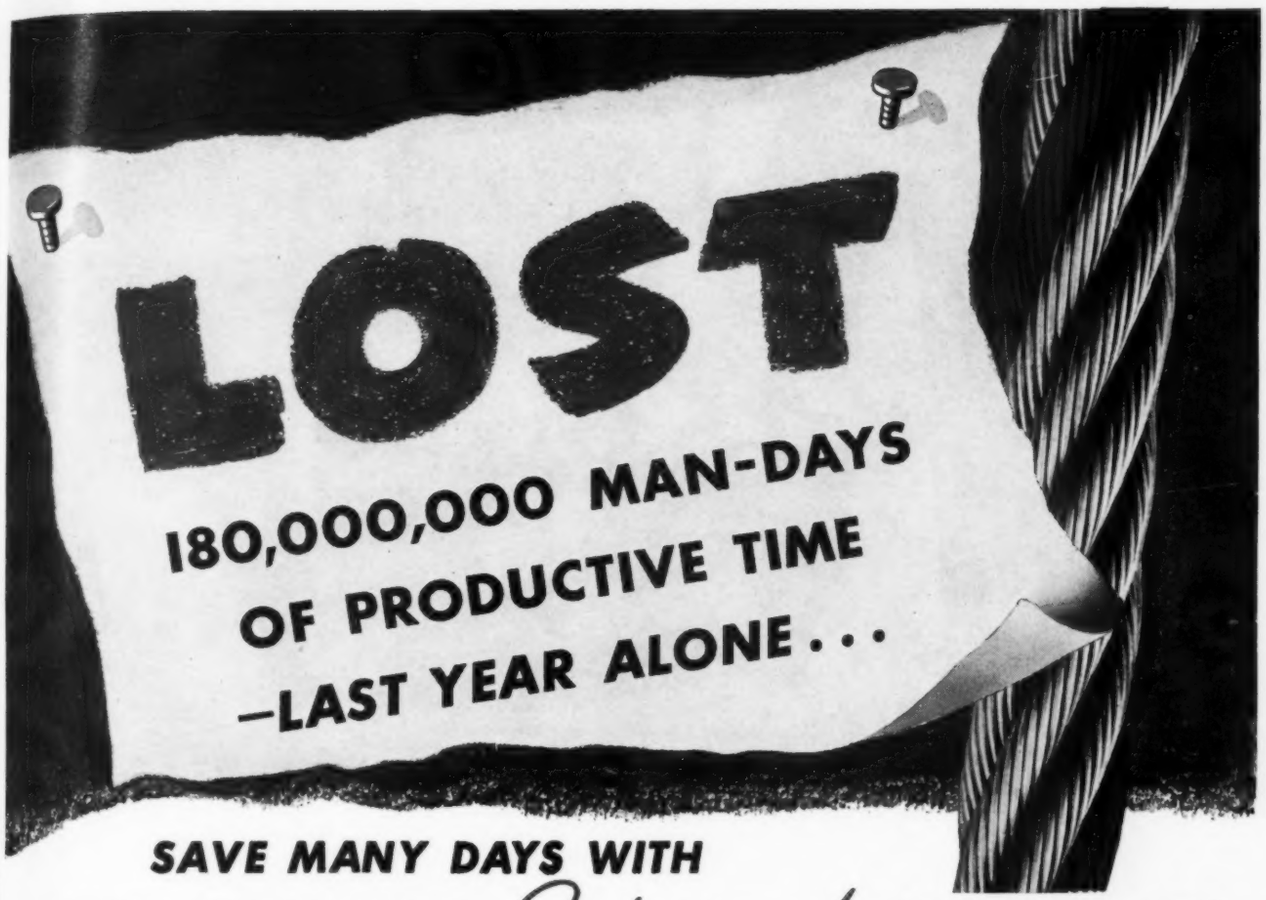
W

Wallace Tire Service, Inc. 97
Walter Motor Truck Co..... 16
Ward, La France..... 36
Warren-Knight Co. 80-96
Warsaw Iron Wks..... —
*Wellman Engineering Co., The..... 93
Wenzel Tent & Duck Co., H..... —
WGB Oil Clarifier, Inc..... —
Wheeler Lumber Bridge Supply Co.. —
White Mfg. Co..... 95
Wiley & Sons, Inc., John..... —
*Williams Form Engr. Corp. 84
*Wisconsin Motor Corp..... 32
Wood Mfg. Co..... 29
Wood Preserving Division Koppers Co. ..... —
Worthington Pump and Machinery Corp. 68-69

Y

York Modern Corp..... —

*Advertisers with * are represented in the 1942 edition of Powers' Road and Street Catalog and Data Book. Please refer to it for additional information on any of their products.



SAVE MANY DAYS WITH

AMERICAN CABLE TRU•LAY *Preformed* WIRE ROPE

Last year over 180 million man-days of productive time were lost through industrial accidents—many of them needless.

Just think how many tanks, ships, guns, planes and so forth could have been made with those 180,000,000 man-days of work. . . . With our soldiers, sailors and marines giving their all, twenty-four hours a day, it is a crime not to do everything possible to reduce this terrific toll on needed production.

AMERICAN CABLE TRU-LAY PREFORMED WIRE ROPE is helping many operators keep down accidents because it is a safer rope to use and handle. **TRU-LAY PREFORMED** resists kinking and snarling. It resists whipping; spools better. When crown wires in **TRU-LAY PREFORMED** become worn and broken they do not wicker out to become chisel-sharp jaggers to tear workmen's hands. They remain in place, making **TRU-LAY** *much* safer to handle.

Use **AMERICAN CABLE TRU-LAY PREFORMED** for your next rope. Do everything possible to reduce lost-time accidents. America needs your full-time production.

AMERICAN CABLE DIVISION

Wilkes-Barre, Pa., Atlanta, Chicago, Detroit, Denver, Los Angeles, New York, Philadelphia, Pittsburgh, Houston, San Francisco, Tacoma

AMERICAN CHAIN & CABLE COMPANY, Inc.

BRIDGEPORT • CONNECTICUT

ESSENTIAL PRODUCTS . . . TRU-LAY Aircraft, Automotive, and Industrial Controls, TRU-LOC Aircraft Terminals, AMERICAN CABLE Wire Rope, TRU-STOP Brakes, AMERICAN Chain, WEED Tire Chains, ACCO Malleable Castings, CAMPBELL Cutting Machines, FORD Hoists, Trolleys, HAZARD Wire Rope, Yacht Rigging, MANLEY Auto Service Equipment, OWEN Springs, PAGE Fence, Shaped Wire, Welding Wire, READING-PRATT & CADY Valves, READING Electric Steel Castings, WRIGHT Hoists, Cranes, Presses . . . *In Business for Your Safety*

Official U. S. Navy Photo

AIMED AT THE AXIS . . . via Compressed Air

DRIVING "tin fish" out of torpedo tubes and through the water to their Axis targets are exciting uses of compressed air.

In less exciting but just-as-important jobs throughout all industry, thousands of air compressors are delivering maximum output . . . lubricated with Texaco.

Texaco Alcaid, Algol or *Ursa Oils* keep compressors free from harmful gum, sludge and hard carbon deposits. Valves open wide and shut pressure tight; rings stay free, ports and air lines clear.

So effective have Texaco Lubricants proved in increasing output that they are definitely preferred in many important fields, a few of which are listed in the panel.

A Texaco Lubrication Engineer will gladly cooperate in the selection of the most suitable lubricants for your equipment. Just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write: The Texas Company, 135 East 42nd Street, New York, N. Y.

THEY PREFER TEXACO

★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated and fueled with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

TEXACO

REG. T.M.

TEXACO Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY